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April 1, 2013

Mr. Mike Cepak
Engineering Manager I
Minerals and Mining Program
South Dakota Department of Environment & Natural Resources
523 East Capitol Avenue
Joe Foss Building
Pierre, SD 57501-3182

Re: Responses to Technical Review Comments
Dewey-Burdock Project Large Scale Mine Permit Application

Dear Mr. Cepak:

On behalf of Powertech (USA) Inc., this letter is provided in response to the technical review comments issued December 14, 2012 and March 1, 2013 for the above-referenced large scale mine (LSM) permit application. For convenience, the comments are provided below in italics followed by the responses. Application replacement pages are enclosed along with an index of changes (three hard copies and one electronic copy on CD). The replacement pages are included as individual PDF files that correspond to the changes shown on the index of changes. For convenience, the enclosed CD also includes a folder with replacement pages incorporated into the application text and appendix files. Only files that were updated as a result of the comment responses are included. In addition, Attachment A provides pre-operational and end-of-production water quality from operating ISR facilities as requested in comment #5.

Technical Comments from December 14, 2012 DENR Comment Letter

1. *SDCL 45-6B-33(5) and SDCL 45-6B-92(1): A meeting was held on December 28, 201[2] with Powertech, the Department of Game, Fish, and Parks, the US Fish and Wildlife Service, and our office to discuss contents of an Avian Monitoring and Mitigation Plan. We understand that Gwen McKee of Thunderbird Wildlife Consulting is currently working on a draft version of the plan. Once a final plan is completed and approved by these agencies, it will become part of the large scale mine permit. It will also need to comply with SDCL 34A-8-8 which authorizes a taking of a bald eagle's nest for very limited circumstances. This statute may therefore determine plan contents as it appears federal permits are valid upon obtaining state authorizations.*

   In the December 4 submittal, Powertech states it will establish buffer zones and seasonal restrictions to protect important bald eagle habitat. Currently the nest and "standard" 1/2 mile buffer encompass the Dewey processing plant, well fields, both proposed and standby land application pivots, monitor wells, process water wells, and overhead power lines. It is reasonable to assume there are developmental and operational challenges that Powertech will need to address in the Avian Monitoring and Management Plan to avoid jeopardizing bald eagles during all project phases.

Response: Powertech is preparing a draft Avian Monitoring and Mitigation Plan, which will be submitted separately to the Department of Game, Fish and Parks (GFP), the U.S. Fish and Wildlife Service (USFWS), and DENR for review and input. Based on the December 28, 2012 meeting with all of these agencies, Powertech understands that the plan will require approval by GFP and DENR. USFWS will review the plan and Powertech will incorporate USFWS recommendations to the extent practicable, but USFWS approval will not be required. Powertech will provide a copy of the final plan approved by GFP and DENR as Appendix 5.6-C to the LSM permit application. Sections 5.6.11.1.11 and 5.6.11.2 have been updated to reference this appendix and revise the description of the Avian Monitoring and Mitigation Plan. In addition, Section 5.6.11.2 has been modified to indicate that if Powertech applies for a non-purposeful take permit, the application will be coordinated with GFP and DENR to ensure compliance with SDCL 34A-8 and other applicable rules and regulations.

2. *ARSD 74:29:07:09(6): Will storm water diversions around the ponds in the land application option be necessary to keep storm water out of the ponds during storm events?*

Response: Two new storm water diversions (Diversion Nos. 4 and 5) have been designed for the Dewey area in the land application option (Plates 5.3-17b and 5.3-18). These diversions are designed to keep storm water out of the treated water storage ponds and spare storage pond. In addition, a new diversion has been designed to keep storm water out of the surge pond in the Dewey area in the deep disposal well option (Plate 5.3-17a). These diversions are capable of passing the 2-year, 6-hour storm event without erosion and have the capacity for a 100-year, 24-hour event. In addition, one new diversion (CPP Facility Diversion No. 4) has been designed for the central plant pond (Burdock area) in the land application option. This diversion has been designed for the 6-hour probable maximum precipitation (PMP) event in accordance with ARSD 74:29:07:09(6).

In the Burdock area, drainage areas above the treated water storage ponds are less than 10 acres. There also are small drainage areas between the catchment areas and Dewey treated water storage ponds of less than 10 acres. Diversions are not planned in these areas due to the small drainage area and small size of the associated runoff events. The pond embankments in these cases will extend at least 1 foot above ground, which along with grading and drainage plans will be sufficient to ensure that no runoff will enter any of the ponds up to the 100-year, 24-hour storm event. Prior to construction, Powertech will prepare grading and drainage plans for the ponds and processing facilities and provide copies to DENR. This information has been added to Section 5.3.9.1.

Plates 5.3-1 (Sheets 1 and 2) and 5.3-2 (Sheet 1) have been updated to depict the new diversion alignments. Please note that the affected area boundary for the deep disposal well option (Plate 5.3-2, Sheet 1) has been modified slightly to accommodate Diversion No. 2, the design for which is depicted on Plate 5.3-10a. The change occurs in the NWSE Section 29, T6S, R1E. To compensate for the minor expansion of the proposed affected area boundary near the diversion, the boundary was made smaller just to the west of this area, resulting in no net change in the proposed affected area.

3. *Appendix 6.4-D, Section 1.4: Powertech needs to include a discussion on complying with the vegetative cover and diversity and other requirements of SDCL 45-6B-39. In the discussion, Powertech should include a minimum live vegetative cover value that will be used to assess the success of final reclamation. For other mines in our state, we use a minimum value of 40 percent live vegetative cover.*

Response: Appendix 6.4-D, Section 1.4 (Sustainability of the Reclamation) has been revised to reference SDCL 45-6B-39, which requires that a diverse, effective, and long-lasting vegetative cover be established that is capable of self-regeneration and at least equal in extent of cover to the natural vegetation of the surrounding area. Compliance with SDCL 45-6B-39 requirements is addressed in Appendix 6.4-D, Section 3.0, which lists the requirements needed to demonstrate successful reclamation (cover, species composition, usable forage production, and reclamation sustainability).

Neither SDCL 45-6B-39 nor ARSD 74:29:07:20 specifically identifies the measures to be used to demonstrate that the requirements have been met. As such, regarding the suggested 40 percent minimum value for live vegetative cover, Powertech would prefer to use the reference area concept as presented in Appendix 6.4-D. Except for a small area reclaimed to cropland, the vast majority the disturbed lands will be reclaimed to a rangeland habitat type using the approved upland grassland seed mixture. Baseline vegetation monitoring results in Appendix 3.7-A show that 10 of the 30 upland grassland transects had a total vegetative cover of less than 40 percent, indicating that 40 percent may not be a representative cover value for upland grassland reclamation within the proposed permit area. In addition, climatic conditions (temperature, precipitation, humidity, and wind – as described in Section 3.6.1.1) are variable, which can result in annual variation in the vegetative cover on a reclaimed plot. The reference area concept, which compares the reclaimed areas with similar, nearby native vegetation, does not require the use of a mathematical adjustment for changes in climatic conditions. If changes in climatic conditions have influenced the vegetation, it is assumed that the revegetated area and undisturbed reference areas will have responded similarly to the changes in climatic conditions. The use of a reference area is a widely accepted method used to determine success of the final reclamation. Appendix 6.4-D includes a statement that the vegetative cover requirement of reclamation success must be verified statistically (percent vegetative cover must be within one standard deviation of the percent vegetative cover documented on the reference areas - as determined during the same year as reclamation sampling) in order to meet the cover criterion for bond release.

Further, prior to final bond release Powertech will be required to demonstrate the sustainability of reclamation, including that the reclamation is effective (capable of withstanding the proper stocking rates for 2 consecutive years) and capable of self-regeneration as described in revised Appendix 6.4-D, Section 1.4. Therefore, reclamation success will not be determined based on a single season but through demonstration that it is sustainable and comparable to reference areas.

4. *Section 5.6.3.2: Regarding notice for excursions, the department will require through permit conditions that Powertech give notice to the department through email or phone within 48 hours of any excursions. Written notice with additional details on the excursion will be required within seven days after the excursion. Since the NRC is the*

primary regulatory agency for the well fields, these data packages will be for the department's information only.

Response: Section 5.6.3.2 has been modified to indicate that DENR will be notified by phone or email within 48 hours of the confirmation of an excursion. This will be followed within 7 days by written notification.

Additional Technical Comments

1. *Section 5.3.3.4, page 5-49: The department will require through permit conditions that Powertech submit copies of well field hydrogeologic data and injection authorization data packages to the department prior to the development of each well field. Since the NRC is the primary regulatory agency for the well fields, these data packages will be for the department's information only.*

Response: Section 5.3.3.4 has been modified to indicate that a copy of each well field hydrogeologic data package and injection authorization data package will be submitted to DENR for information purposes. This section also has been modified to indicate that all well field hydrogeologic data packages will be submitted to NRC for review. This revision reflects the most current language in Powertech's draft NRC license.

2. *Section 5.3.4.5, page 5-65: Regarding pond leak detection, the department requests copies of any plans submitted to NRC for response actions to leakage in the pond liners. Typically, the leakage response plans (also called Action Response Plans) would include the actions to be taken at various leakage thresholds. These actions would range from monitoring leakage only to the shutdown and repair of ponds.*

Response: Powertech will be required by NRC license condition to develop standard operating procedures (SOPs) prior to operations for leaks or spills, including pond leakage. Powertech will provide DENR with a copy of the SOP(s) addressing response actions to leakage in the pond liners. Section 5.3.4.5 has been updated to include this commitment. As described in Section 5.3.4.5, Powertech does not anticipate including a range of response actions for a confirmed leak. Upon confirmation of a leak by analysis of the water in the standpipe of a leak detection system, the leak will be reported, the pond will be removed from service, and the pond contents will be transferred to a spare pond with the same level of lining system as the leaking pond. Each of the Dewey and Burdock areas will have a spare pond of equal capacity and lining system as each of the normally operated ponds. The leaking pond will be repaired and tested prior to returning it to service.

Also, regarding pond leakage, we have found it to be helpful at the heap leach gold mines to install automatic or continuous pumping systems in the leakage detection gallery. This will limit build-up of solution in the leak detection gallery and will minimize hydraulic head on the secondary liner.

Response: As described in the previous comment response, any confirmed leak in a primary pond liner will result in taking the pond out of service, transferring its contents to a spare pond, and repairing the leak. If recurring water is present in a leak detection system and it is confirmed through laboratory analysis that it is not caused by a leak (e.g., condensation could collect in the leak detection system), Powertech may elect to install a submersible pump in the leak detection system sump to routinely dewater the leak detection system and minimize the hydraulic head on the secondary liner. The pond design drawings in Appendix 5.3-A and 5.3-B show that an access port and 8-inch diameter PVC pipe will be available to lower a submersible pump into the leak detection sump. This information has been added to Section 5.3.4.5.

3. *Section 5.3.4.5, page 5-71: The department will require through permit conditions that Powertech notify the department of any pond leaks within 48 hours of detection. Since the NRC is the primary regulatory agency for the well fields, this will be for the department's information only.*

Response: Section 5.3.4.5 has been modified to include the commitment to notify DENR within 48 hours of any confirmed pond leak.

4. *Table 5.4-2, page 5-85: Were other metals such as selenium and other radionuclides evaluated for end of production water quality during the development of Table 5.4-2? If so, please include them in the table.*

Response: Powertech has revised Table 5.4-2 in response to this comment and clarification received in a March 12, 2013 conference call. Additional parameters have been added to the end-of-production groundwater quality estimates in Table 5.4-2 as requested including: arsenic, copper, selenium, lead, molybdenum, uranium, vanadium, zinc, gross alpha and radium-226. The land application water quality estimate in Table 5.4-3 also was updated based on the changes to Table 5.4-2. In addition, the text in Section 5.4.1.1.4.1 was updated to reflect the methods used to prepare the tables. Following is a description of these methods.

As noted in the footnote to Table 5.4-3, the end-of-production groundwater quality in the ore zone originally was estimated using a combination of laboratory leach tests and historical end-of-production groundwater quality data from operating ISR facilities in Wyoming and Nebraska. Powertech has revised the estimates to add the requested parameters and use only data from operating ISR facilities. While laboratory leaching studies are useful to support estimates of uranium recovery rates, actual data from operating facilities provide a better estimate of groundwater quality changes due to the various ISR processes (including *in-situ* oxidation and dissolution of uranium and ion exchange in the processing facilities). Laboratory leaching studies generally are not designed to provide accurate estimates of end-of-production groundwater quality. Some of their limitations in this regard include pulverizing ore samples prior to testing (which exposes the ore to air and breaks down some of the sand grains), substituting lixiviant formulations (i.e., sodium-bicarbonate solutions often are used in ambient-pressure leaching studies), substituting simulated groundwater for actual ore zone groundwater, and using lower residence times for chemical reactions. In the case of the Dewey-Burdock Project, use of laboratory leaching studies is limited to estimating uranium recovery rates based on ambient-pressure laboratory tests. While pressurized, column-leach testing was performed, the core

samples had been exposed to air prior to testing and pressures and lixiviant chemistry did not necessarily match *in-situ* conditions. Therefore, the results of these tests are not used in estimating end-of-production groundwater quality.

The revised Table 5.4-2 was prepared using publicly available baseline (pre-operational) and end-of-production groundwater quality data from three ISR facilities in Wyoming (Irigaray Mine, Christensen Ranch and Smith Ranch/Highland Project) and one in Nebraska (Crow Butte Project). Tables 1 and 2 compare the baseline and end-of-production groundwater quality at these facilities. The data sources are provided in Attachment A and summarized as follows:

- Irigaray Mine (Johnson County, WY): baseline and end-of-production water quality data were obtained for individual wells in each of nine mine units that were sampled prior to and at the end of production (these wells are highlighted in Attachment A).
- Christensen Ranch Project (Johnson County, WY): average baseline values or target restoration values (TRVs) were available along with average end-of-production values for each of five mine units. TRVs, which were calculated for each mine unit as a function of the average baseline concentration and variability, were used when average concentrations were not reported.
- Smith Ranch/Highland Project (Converse County, WY), average baseline and end-of-production values were available for one mine unit.
- Crow Butte Project (Dawes County, NE): typical baseline and end-of-production values were available for the overall project.

Table 1. Typical Baseline Groundwater Quality at Wyoming and Nebraska ISR Facilities

Parameter	Units	Irigaray[1]	Christensen Ranch[2]	Smith Ranch/ Highland[3]	Crow Butte[4]
Physical Properties					
pH	s.u.	8.1 - 9.7	8.6 - 10.1	8.1	8.1
TDS	mg/L	353 - 568	412 - 860	350	1,804
EC	µmhos/cm	571 - 900	682 - 1,365	564	2,723
Common Elements and Ions					
Bicarbonate	mg/L	52 - 125	74 - 205	206	401
Carbonate	mg/L	3.2 - 33	4.5 - 120	0.2	0
Chloride	mg/L	10 - 13	4.6 - 11	5.3	202
Sulfate	mg/L	154 - 302	198 - 533	117	737
Calcium	mg/L	4 - 17	7.9 - 26	50	30
Magnesium	mg/L	0.4 - 4.4	0.8 - 4.5	10	5.3
Sodium	mg/L	101 - 175	109 - 240	57	567
Potassium	mg/L	1.4 - 6.8	3.5 - 10	8.0	15
Minor Ions and Trace Elements					
Arsenic	mg/L	<0.001 - 0.016	0.002 - 0.007	<0.001	<0.002
Barium	mg/L	0.019 - 0.072	<0.1	<0.1	<0.1
Cadmium	mg/L	<0.002 - 0.003	<0.01	<0.01	<0.01
Chromium	mg/L	0.0015 - 0.0075	<0.05	<0.05	<0.05
Copper	mg/L	<0.005 - 0.03	<0.01	<0.01	<0.01
Iron	mg/L	<0.02 - 4.1	<0.05 - 0.069	0.052	<0.05
Lead	mg/L	0.005 - 0.032	<0.05	<0.05	<0.05
Molybdenum	mg/L	<0.1	<0.1	<0.1	<0.1
Nickel	mg/L	<0.001 - 0.008	<0.05	<0.05	<0.05
Selenium	mg/L	<0.001 - 0.34	<0.01	<0.001	<0.175
Uranium	mg/L	0.01 - 14	0.0001 - 0.23	0.062	<0.0032
Vanadium	mg/L	<0.1 - 0.34	<0.05 - 0.14	<0.1	<0.1
Zinc	mg/L	0.01 - 0.07	<0.01 - 0.23	<0.01	<0.02
Radiological Parameters					
Goss alpha	pCi/L	ND	ND	ND	ND
Radium-226	pCi/L	5.3 - 144	67.6 - 214	316	11.9

[1] COGEMA (2004); [2] COGEMA (2008); [3] CAMECO (2009); [4] Crow Butte (2007)
ND - no data available

Table 2. Typical End-of-Production Groundwater Quality at Wyoming and Nebraska ISR Facilities

Parameter	Units	Irigaray[1]	Christensen Ranch[2]	Smith Ranch/ Highland[3]	Crow Butte[4]
Physical Properties					
pH	s.u.	6.9 - 7.8	7.3 - 7.7	6.9	7.8
TDS	mg/L	863 - 3,614	3,055 - 3,774	1,672	4,080
EC	µmhos/cm	1,690 - 4,881	4,008 - 4,788	2,580	6,000
Common Elements and Ions					
Bicarbonate	mg/L	469 - 1,463	1,393 - 2,280	824	2,050
Carbonate	mg/L	<0.1	<2	0	<1
Chloride	mg/L	86 - 429	121 - 177	232	600
Sulfate	mg/L	264 - 1,249	784 - 1,089	402	900
Calcium	mg/L	40 - 356	268 - 325	349	77
Magnesium	mg/L	10 - 77	53 - 62	66	23
Sodium	mg/L	262 - 840	598 - 863	83	1,310
Potassium	mg/L	5.9 - 11	9.4 - 13	17	35
Minor Ions and Trace Elements					
Arsenic	mg/L	<0.001 - 0.008	0.011 - 0.12	0.008	0.06
Barium	mg/L	<0.1	0.1	0.1	<0.1
Cadmium	mg/L	<0.01	0.01	0.01	<0.005
Chromium	mg/L	<0.05	0.05	0.1	<0.05
Copper	mg/L	<0.01 - 0.02	0.01	0.01	0.04
Iron	mg/L	<0.05 - 6.9	0.14 - 2.81	0.1	<0.03
Lead	mg/L	<0.05	0.05	0.1	<0.05
Molybdenum	mg/L	<0.1	0.1	0.1	0.5
Nickel	mg/L	<0.05	0.05	0.07	<0.05
Selenium	mg/L	0.05 - 1.05	0.55 - 6.3	0.81	0.07
Uranium	mg/L	0.46 - 22	12 - 18	22	44
Vanadium	mg/L	<0.1	0.22 - 0.61	0.1	2.5
Zinc	mg/L	0.01 - 0.05	0.01 - 0.05	0.11	0.02
Radiological Parameters					
Goss alpha	pCi/L	ND	ND	ND	ND
Radium-226	pCi/L	27 - 565	258 - 526	1,478	1,090

[1] COGEMA (2004); [2] COGEMA (2008); [3] CAMECO (2009); [4] Crow Butte (2007)
ND - no data available

Table 3 calculates the typical change in concentration of various constituents during ISR. The values in Table 3 were added to the typical baseline values in the Dewey and Burdock areas to estimate end-of-production water quality at the Dewey-Burdock Project. These revised estimates are provided in Table 5.4-2. When comparing the previous and revised estimates, most parameters are similar. For example, the revised sulfate estimates are 883 mg/L (Dewey) and 1,751 mg/L (Burdock), which closely matches the previous estimates of 1,000 and 1,800 mg/L, respectively. Notable differences between the previous and revised estimates include:

- TDS: the revised estimate in the Dewey area (3,035 mg/L) is significantly lower than the previous estimate (4,500 mg/L).
- Bicarbonate: the revised estimates (1,531 to 1,624 mg/L) are significantly higher than the previous estimate (25 mg/L). Note that the bicarbonate estimate may be conservatively high, since the Dewey-Burdock project will use a lixiviant comprising groundwater fortified with dissolved oxygen and carbon dioxide instead of a sodium-bicarbonate solution, which is used at some other ISR facilities.
- Chloride: the revised estimates (265 to 267 mg/L) are significantly lower than the previous estimate (1,300 mg/L).
- Sodium: the revised estimates (603 to 676 mg/L) are significantly higher than the previous estimates (190 to 270 mg/L). Note that the sodium estimate may be conservatively high, since the Dewey-Burdock project will use a lixiviant comprising groundwater fortified with dissolved oxygen and carbon dioxide instead of a sodium-bicarbonate solution, which is which is used at some other ISR facilities.
- SAR: the revised estimates (5.6 to 9.5) are higher than the previous estimates (calculated values were 1.4 to 2.4 and estimated end-of-production values were 2.8 to 4.9). These changes are caused by increased estimates of the change in sodium concentrations coupled with decreased estimates of the change in calcium and magnesium. SAR is addressed in the response to comment #9.
- Arsenic: the revised estimate (0.03 mg/L) is higher than the previous estimate (0.01 mg/L).
- Vanadium: the revised estimate is lower than the previous estimate. The vanadium concentration at the end of production will depend on a number of factors including the ratio of vanadium to uranium in the ore, the vanadium leaching kinetics, and Powertech's decision whether or not to recover vanadium. As noted in the Preliminary Economic Assessment of the Dewey-Burdock Project (SRK Consulting, 2012), "Available data do not allow a rigorous determination of the amount of vanadium that will dissolve during commercial leaching."

Table 3. Typical Groundwater Quality Change from Baseline to End-of-Production at Wyoming and Nebraska ISR Facilities

Parameter	Units	Irigaray[1]	Christensen Ranch[2]	Smith Ranch/ Highland[3]	Crow Butte[4]	Average Change
Physical Properties						
pH	s.u.	-1.5	-1.6	-1.2	-0.3	-1.2
TDS	mg/L	2,234	2,677	1,322	2,276	2,127
EC	µmhos/cm	3,291	3,311	2,016	3,277	2,974
Common Elements and Ions						
Bicarbonate	mg/L	1,370	1,642	618	1,649	1,320
Carbonate	mg/L	-12	-35	-0.2	<1	-16
Chloride	mg/L	251	133	227	398	252
Sulfate	mg/L	517	633	285	163	400
Calcium	mg/L	213	284	299	47	211
Magnesium	mg/L	49	56	56	18	45
Sodium	mg/L	543	546	26	743	465
Potassium	mg/L	6.5	5.4	9	20	10.2
Minor Ions and Trace Elements						
Arsenic	mg/L	<0.01	0.035	0.008	0.06	0.027
Barium	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	mg/L	<0.01	<0.01	<0.01	<0.005	<0.01
Chromium	mg/L	<0.05	<0.05	<0.1	<0.05	<0.05
Copper	mg/L	<0.01	<0.01	<0.01	0.035	0.013
Iron	mg/L	0.3	0.8	<0.1	<0.03	0.29
Lead	mg/L	<0.05	<0.05	<0.1	<0.05	<0.05
Molybdenum	mg/L	<0.1	<0.1	<0.1	0.45	<0.2
Nickel	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	mg/L	0.15	3.1	0.81	0.07	1.0
Uranium	mg/L	6.0	14	22	44	22
Vanadium	mg/L	<0.1	0.27	<0.1	2.5	0.72
Zinc	mg/L	0.012	<0.01	0.1	0.02	0.034
Radiological Parameters						
Goss alpha	pCi/L	ND	ND	ND	ND	ND
Radium-226	pCi/L	180	302	1,162	1,078	681

[1] COGEMA (2004); [2] COGEMA (2008); [3] CAMECO (2009); [4] Crow Butte (2007)
ND - no data available

Table 5.4-2. Estimated End-of-Production Groundwater Quality at the Dewey-Burdock Project (Revised)

Parameter	Units	Typical Dewey Baseline[1]	Typical Burdock Baseline[2]	Typical Change[3]	End-of-Production Dewey Estimate	End-of-Production Burdock Estimate
Physical Properties						
pH	s.u.	7.9	7.3	-1.2	6.5 - 7.5	6.5 - 7.5
TDS	mg/L	908	2,293	2,127	3,035	4,420
EC	µmhos/cm	1,323	2,621	2,974	4,297	5,595
Common Elements and Ions						
Bicarbonate[4]	mg/L	211	304	1,320	1,531	1,624
Carbonate	mg/L	<5	<5	-16	<5	<5
Chloride	mg/L	15	13	252	267	265
Sulfate	mg/L	483	1,351	400	883	1,751
Calcium	mg/L	63	386	211	274	597
Magnesium	mg/L	24	124	45	69	169
Sodium[4]	mg/L	211	138	465	676	603
Potassium	mg/L	10	19	10	20	29
Minor Ions and Trace Elements						
Arsenic	mg/L	0.002	0.0045	0.027	0.03	0.03
Barium	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	mg/L	<0.005	<0.005	<0.01	<0.01	<0.01
Chromium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	mg/L	<0.01	<0.01	0.013	0.013	0.013
Iron	mg/L	<0.03	0.17	0.291	0.31	0.46
Lead	mg/L	0.007	<0.001	<0.05	<0.05	<0.05
Molybdenum	mg/L	<0.1	<0.1	<0.2	<0.2	<0.2
Nickel	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	mg/L	<0.005	0.0009	1.0	1.0	1.0
Uranium	mg/L	0.01	0.034	22	22	22
Vanadium	mg/L	<0.1	<0.1	0.7	0.7	0.7
Zinc	mg/L	0.01	0.007	0.034	0.04	0.04
Radiological Parameters						
Goss alpha	pCi/L	1,502	4,991	ND	ND	ND
Radium-226	pCi/L	380	1,289	681	1,061	1,970
Calculated Parameters						
SAR (calc.)	unitless	5.7	1.6	ND	9.5	5.6
ESP (calc.)	unitless	6.7	1.0	ND	11.3	6.6
RSC (calc.)	meq/L	-1.7	-24.5	ND	5.9	-16.9

[1] Hydro ID 681 (see Appendix 3.4-G); [2] Hydro ID 680 (see Appendix 3.4-G)

[3] Changes in groundwater quality were calculated based on historical baseline and end-of-production groundwater quality from ISR facilities in Wyoming and Nebraska.

[4] Sodium and bicarbonate estimates may be conservatively high, since the Dewey-Burdock project will use a lixiviant comprising groundwater fortified with dissolved oxygen and carbon dioxide instead of a sodium-bicarbonate solution, which is used at some other ISR facilities.

ND - no data available

Table 5.4-3 presents the estimated land application water quality based on the revisions to Table 5.4-2. Changes to the previous version of this table are indicated in bold text. Most of these changes reflect the previously described changes in estimated end-of-production water quality (e.g., SAR, bicarbonate, chloride, and sodium). The estimated concentrations of metals and trace elements have been revised based on the methodology described above. In most cases the revised estimates are lower than the previous estimates (barium, cadmium, chromium, copper, nickel, and vanadium). In a few cases the revised estimates are higher than the previous estimates (arsenic, iron, molybdenum, and selenium). The revised table also contains several parameters not previously estimated (lead, zinc, and Po-210).

Table 5.4-3. Estimated Land Application Water Quality (Revised)

Parameter	Units	Land Application Water Estimate
Physical Properties		
pH	s.u.	6.5 - 7.5
TDS	mg/L	1,000 - 5,000
EC	µmhos/cm	1,500 - 6,000
Common Elements and Ions		
Bicarbonate	**mg/L**	**500 - 2,000**
Carbonate	mg/L	<1
Chloride	**mg/L**	**100 - 400**
Sulfate	mg/L	500 - 2,000
Calcium	mg/L	200 - 1,000
Magnesium	mg/L	50 - 300
Sodium	**mg/L**	**200 - 1,000**
Potassium	**mg/L**	**10 - 50**
SAR	**unitless**	**5 - 10**
Minor Ions and Trace Elements		
Arsenic	**mg/L**	**<0.03**
Barium	**mg/L**	**<0.1**
Cadmium	**mg/L**	**<0.01**
Chromium	**mg/L**	**<0.05**
Copper	**mg/L**	**<0.02**
Iron	**mg/L**	**<1**
Lead	**mg/L**	**<0.05**
Molybdenum	**mg/L**	**<0.2**
Nickel	**mg/L**	**<0.05**
Selenium	**mg/L**	**<1**
Vanadium	**mg/L**	**<1**
Zinc	**mg/L**	**<0.05**
Radiological Parameters		
Lead-210	pCi/L	<10
Polonium-210	**pCi/L**	**<40**
Radium-226	pCi/L	<60
Thorium-230	pCi/L	<100
U-natural	pCi/L	<300

bold text indicates change from original Table 5.4-3 (September 2012 version).

Note: Estimates of land application water quality were based on Dewey-Burdock Project baseline water quality and historical baseline and end-of-production groundwater quality from ISR facilities in Wyoming and Nebraska, with adjustments as necessary to account for planned post-production water treatments.

5. *Table 5.4-3, page 5-87: Please submit the results from the laboratory scale leach tests conducted on ore samples from the Dewey and Burdock sites and the historic end of production water quality data from in situ sites in Wyoming and Nebraska that were used to develop the land application water quality estimates in the table.*

Response: Attachment A includes historical water quality data from ISR facilities in Wyoming and Nebraska that were used to prepare the revised estimates of end-of-production groundwater quality and land application water quality. As previously described, the leach tests are no longer used for these estimates.

6. *Section 5.6.11.1.5, page 5-156: In the first paragraph of this section, please identify which raptor species are using the nests in close proximity to the mining area.*

Response: Section 5.6.11.1.5 has been revised to include the list of raptor species associated with raptor nests or potential nest sites within the proposed permit boundary and surrounding survey area. These include the great horned owl, long-eared owl, red-tailed hawk, merlin and bald eagle.

7. *Section 5.6.11.1.7, page 5-157: Please identify the birds tracked by the SDNHP.*

Response: Section 5.6.11.1.7 has been revised to indicate that 19 other bird species (non-raptors, non-game, and non-waterfowl/shorebirds) tracked by the South Dakota National Heritage Program (SDNHP) have the potential of occurring in the proposed permit area. These species were indicated in bold in Appendix I to Appendix 3.9-A and include: common poorwill, Lewis' woodpecker, three-toed woodpecker, black-backed woodpecker, olive-sided flycatcher, Cassin's kingbird, Clark's nutcracker, brown creeper, pygmy nuthatch, veery, northern mockingbird, sage thrasher, Sprague's pipit, black-and-white warbler, Virginia's warbler, Brewer's sparrow, Baird's sparrow, McCown's longspur and Cassin's finch. Only one of these species (Clark's nutcracker) was documented in or within 1 mile of the proposed permit area during the baseline survey period. The nutcracker was observed once flying over the proposed permit area, but no known nesting or other targeted use was recorded by this species.

In addition, Sections 5.6.11.1.4, 5.6.11.1.5 and 5.6.11.1.8 through 5.6.11.1.10 have been updated to address the mammals, raptors, waterfowl/shorebirds, reptiles/amphibians, and fish/macro-invertebrates tracked by SDNHP. These are summarized as follows:

- Mammals (Section 5.6.11.1.4): 14 mammal species tracked by SDNHP have the potential of occurring in the proposed permit area (Merriam's shrew, dwarf shrew, long-eared myotis, fringe-tailed myotis, northern myotis, silver-haired bat, Townsend's big-eared bat, northern flying squirrel, northern river otter, meadow jumping mouse, swift fox, black-footed ferret, eastern spotted skunk, and mountain lion). Only the northern river otter was observed in the vicinity of the proposed permit area; this was a carcass observed at the upstream sampling point on Beaver Creek.
- Raptors (Section 5.6.11.1.5): 16 raptor species tracked by SDNHP have the potential of occurring in the proposed permit area (osprey, bald eagle, sharp-shinned hawk, Cooper's hawk, northern goshawk, broad-winged hawk, Swainson's hawk, ferruginous hawk,

golden eagle, merlin, peregrine falcon, prairie falcon, barn owl, northern saw-whet owl, long-eared owl, and burrowing owl). The bald eagle, long-eared owl, and merlin are known or are suspected to have nested in or within 1 mile of the proposed permit area based on evidence (young present) or persistent defensive behavior.

- Waterfowl and shorebirds (Section 5.6.11.1.8): 18 waterfowl/shorebird species tracked by SDNHP have the potential of occurring in the proposed permit area (common loon, horned grebe, American white pelican, great blue heron, black-crowned night heron, green-backed heron, white-faced ibis, bufflehead, hooded merganser, common merganser, whooping crane, mountain plover, piping plover, long-billed curlew, California gull, common tern, black tern, and interior least tern). The long-billed curlew, great blue heron, and American white pelican were documented in or within 1 mile of the proposed permit area during the baseline survey period. The long-billed curlew is suspected to have nested in or within 1 mile of the proposed permit area based on persistent defensive behavior.
- Reptiles and amphibians (Section 5.6.11.1.9): Three reptile species and zero amphibian species tracked by SDNHP have the potential of occurring in the proposed permit area (northern sagebrush lizard, smooth green snake and brown snake). None of these species was observed in or around the proposed permit area.
- Fish and macro-invertebrates (Section 5.6.11.1.10): Appendix II to Appendix 3.9-A shows that one fish species tracked by SDNHP has the potential of occurring in the proposed permit area (plains topminnow). The plains topminnow was captured during fish sampling efforts in the Cheyenne River and the downstream sampling site along Beaver Creek during baseline surveys; both sites are outside of the proposed permit area.

8. *Section 5.6.11.1.11, page 5-160: Please identify the SDNHP species mentioned in the "Species Tracked by SDNHP" section.*

Response: Section 5.6.11.1.11 has been revised as requested to update the discussion on species tracked by SDNHP.

9. *Sections 5.5.6 and 5.5.7, pages 5-113 and 5-113a: During our technical review of the mine permit application, we have had discussions with the Department of Game, Fish, and Parks over its concerns with the bioaccumulation of metals in the food chain, especially selenium. The Custer County Conservation District also expressed concerns over the buildup of salts in the soil profile based on the elevated SAR in the baseline soil data. We also have concerns over the development of saline seep conditions in the land application area over time similar to the alkaline area referenced in the mine permit application.*

Mr. Michals, GFP, submitted the report "Selenium in a Wyoming Grassland Community Receiving Wastewater from an In Situ Uranium Mine" which was developed by the US Fish and Wildlife Service. This report is the basis of his agency's concerns. Powertech has indicated it has a copy of this report. Please discuss the potential for the impacts described in the report to occur in Powertech's land application area in situ mine site and mitigative measures such as additional treatment to remove selenium prior to land

application. If there will be the potential for similar impacts, please address if Powertech plans to do additional sampling in addition to the soil and vegetative sampling, such as collecting tissue samples of grasshoppers and birds for selenium and other metal analysis.

Response: The USFWS report (Ramirez and Rogers, 2000) describes how selenium concentrations in soil, water, grass, insects, and birds were higher at a land application site associated with a Wyoming ISR facility than at a reference area. There are several key differences between the design and operation of the Wyoming land application site and the proposed Dewey-Burdock Project land application systems that will minimize the potential for similar impacts to occur. These include:

- Water application rate: The Wyoming system reportedly applied 0.25 inch of water per day to a 58-acre land application area. In contrast, the proposed land application rate at the Dewey-Burdock Project is 19 inches over the typical irrigation season of March 29 through October 31 (see Appendix 5.3-A). This equates to 19 inches over 217 days or less than 0.09 inch per day. The potential loading rate for selenium and other constituents of concern is therefore about one-third of that at the Wyoming facility assuming the concentrations are the same.
- Standing water: The USFWS report indicated that standing water and cattails present within the Wyoming ISR facility land application area promoted bird nesting (specifically red-wing blackbirds). The USFWS report recommends preventing ponding water and cattail growth to discourage nesting. Powertech will operate the land application systems at an agronomic rate that will prevent ponding and runoff (see Section 5.4.1.1.2 and GDP Section 5.4). The catchment areas will not be allowed to fill with land applied effluent (see GDP Section 5.4). These commitments are incorporated into draft GDP permit condition #4, which requires Powertech to ensure that the application rate does not cause water to accumulate in the catchment areas or cause excessive ponding in the land application areas during dry conditions. Further, Powertech commits to monitoring the selenium concentration of runoff/snowmelt that accumulates in the catchment areas and dewatering the catchment areas if trigger values are exceeded (see response to comment #15).
- Soil concentration: The reported soil selenium concentration at the Wyoming ISR facility land application system ranged from 2.6 to 4.2 ppm and averaged 3.1 ppm (note that no baseline was given for the Wyoming ISR facility land application system in the USFWS report). In contrast, the range of selenium in soil samples from the proposed Dewey-Burdock land application areas has ranged from non-detect to 3 ppm and averaged 0.6 (Burdock) to 0.8 ppm (Dewey). The average value is approximately the same as the average in the reference area used in the USFWS report. GDP Section 6.4 describes how prior to operation two baseline soil samples at two different depths (0-18" and 18-36") will be collected from each quadrant of each center pivot (8 total samples per pivot). GDP Section 8.3 describes how trigger values will be established as the average baseline concentration plus 2 standard deviations for each sample depth in each pivot area. This calculation will yield a trigger value that is within or close to the range of baseline concentrations. If the soil concentration approaches the trigger value, a mitigation plan will be implemented (see below). Therefore, the soil selenium concentration will be

maintained at levels that are much closer to the reference area in USFWS report than the Wyoming ISR facility land application area.

- Aquatic plants: The USFWS report analyzed pondweed samples from the wastewater storage reservoir associated with the Wyoming ISR facility land application system. It noted that the selenium concentrations were extremely elevated (434 to 508 ppm), representing a potential impact to waterfowl. In the case of the Dewey-Burdock Project, the ponds will be lined and catchment areas will only contain water temporarily following precipitation or snowmelt. Synthetic pond liners will inhibit the growth of aquatic vegetation which might otherwise serve as a potential source of exposure to contaminants via a food pathway.

Following is a summary of the monitoring and mitigation measures that will be implemented at the Dewey-Burdock Project to minimize potential impacts due to selenium bioaccumulation in the land application systems.

1) Effluent monitoring: Prior to operation of the land application systems each year, Powertech will sample the treated water storage ponds and have the samples analyzed for the parameters in Table 6.2-1, including selenium. Each month during operation of the land application systems, effluent samples will be collected and analyzed for the parameters in Table 6.2-1. (See Section 5.5.4.1.)
2) Trigger values in treated water storage ponds: Powertech will implement an avian deterrent system in ponds with dual synthetic liners and establish trigger values for selenium and other parameters in the treated water storage ponds and other ponds with one synthetic liner (see response to comment GFP-1(b)). Avian deterrent systems in the treated water storage ponds will be implemented if trigger values are exceeded.
3) Trigger values in catchment areas: Powertech will establish trigger values for runoff and snowmelt that accumulate in catchment areas (see response to comment #15). The catchment areas will be dewatered if trigger values are exceeded.
4) Agronomic application rate: land application effluent will be applied at an agronomic rate of approximately 19 inches per year, which will help prevent ponding and will limit the quantity of selenium applied per unit area. Excessive ponding will not be allowed per GDP permit condition #4. Ponding and cattails that could promote bird nesting will be avoided.
5) Soil monitoring: soil samples will be collected prior to land application and used to establish trigger values for selenium in each pivot area. These will be based on the average baseline water quality and variation (2 standard deviations). During operation, at least two soil samples will be collected each year from each pivot active that year. Samples will be analyzed for a long list of parameters including selenium (see Section 5.5.6.1).
6) Soil mitigation: should the selenium trigger value be approached in a pivot area, a mitigation plan will be implemented. The contingency plan will include one or more of the following action items (Section 5.6.2.2):
    - Additional sampling
    - Modify operating parameters (e.g., discharge rate, active pivots)
    - Implement water treatment if necessary specifically for selenium (this could potentially include removal or conversion to a non-soluble form)

- Implement a phytoremediation plan to control buildup of selenium in soil
- Excavate soil if above reclamation standards

7) Vegetation monitoring: samples of vegetation will be collected from three pivot areas in each of the Dewey and Burdock areas each year and analyzed for a long list of parameters including selenium (GDP Section 6.5). The monitoring results will be compared to trigger values for selenium and other parameters, which will be provided to DENR for review and approval prior to land application (Section 5.5.7.1).
8) Vegetation mitigation: Powertech will evaluate annual sample results and implement a contingency plan if there is an increasing trend in the selenium concentration or if the trigger value is approached. The contingency plan is similar to that described above for soil monitoring (GDP Section 8.4).
9) Livestock monitoring: Powertech will work with landowners to prevent livestock grazing during operation of the land application systems. Should livestock graze on the areas or consume crops grown in the areas, livestock will be sampled annually and analyzed for constituents that include selenium (GDP Section 6.6).
10) Prairie dog monitoring: Powertech will sample prairie dogs prior to land application system operation and every year during operation as described in the response to comment #GFP-3(a).
11) Wildlife exclusion: Powertech will construct wildlife exclusion fencing around land application areas if monitoring results indicate potential impacts to wildlife (see response to comment #GFP-3(a)).
12) Groundwater monitoring: extensive groundwater monitoring will ensure that selenium does not cause the alluvial groundwater to exceed the SD groundwater quality standard for selenium at the POP zone boundary. This will include vadose zone monitoring beneath each land application area, interior wells, and compliance wells. (See Section 5.5.2.4 and GDP Section 6.1.1).
13) Surface water monitoring: streams and impoundments downgradient from land application systems will be sampled quarterly and analyzed for a long list of parameters including selenium (See Section 5.5.3 and GDP Section 6.2).

Powertech should also consider analyzing samples of water from the land application ponds for metals, common elements such as sodium and chloride, and SAR prior to land application.

Response: As described in the previous comment response, Powertech will analyze samples of water from the treated water storage ponds for the constituents in Table 6.2-1 prior to operation of the land application systems each year. The requested analytes are included in Table 6.2-1 except SAR, which may be calculated from the analysis of sodium, calcium, and magnesium concentrations.

Please discuss the potential for the buildup of salts in the soil profile and the development of saline seep conditions in the land application area. Also, please describe the measures Powertech plans to take to mitigate any problems that develop from salt buildup and saline seep.

Response: Potential salinity impacts in the land application areas are a function of the baseline soil salinity, land applied water quality, leaching practices, and reclamation crop salinity tolerance. Each of these is described below.

Baseline Soil Salinity

Baseline soil salinity profiles for soil samples collected from within or near the Burdock and Dewey land application areas are presented in Figures 1 and 2. These were generated using the laboratory-measured saturation extract electrical conductivity (EC) presented in Appendix 3.3-A. The salinity profiles represent typical soil salinity conditions in this semiarid area, with baseline soil salinity increasing with depth. These figures show that the top 1 to 3 feet, where most of the plant root zone is located, has salinity ranging from about 0.5 dS/m to greater than 5 dS/m. The salinity from 3 to 5 feet below ground surface is considerably higher, ranging from about 5 to 15 dS/m. According to the *Western Fertilizer Handbook* (California Plant Health Association, 2002), soils that have a conductivity of the saturation extract greater than 4 dS/m and exchangeable sodium percentage (ESP) less than 15 are considered saline soils. Figures 1 and 2 show that generally the near-surface soils do not meet this classification, although there are some instances where the baseline salinity in the top 3 feet exceeds 4 dS/m. Note that the highest levels of baseline soil salinity are associated with samples collected in or near drainage bottoms (#41 and #73) and may not be as representative as the other samples of typical land application baseline soil salinity (refer to Plate 3.6-1 for soil sample locations).

Land Application Water Quality

As described in Section 5.4.1.1.4.1, the primary source of land applied water will be production and restoration bleed. Table 4 presents the approximate contribution from various sources over the life of the project and shows that approximately 94% of the land applied water will result from production and restoration bleed. Section 5.4.1.1.4.1 describes how during production the water quality in each well field will transition from baseline to end-of-production water quality. This process will be reversed during groundwater restoration, with the groundwater quality gradually improving to approximately baseline conditions. Table 5.4-2, which has been revised in response to comment #4, presents the estimated end-of-production water quality. Table 5.4-3 (also revised) presents the estimated land application water quality. In terms of salinity, the TDS is expected to range from 1,000 to 5,000 mg/L and the EC from 1,500 to 6,000 µmhos/cm (1.5 to 6 dS/m). The typical salinity level of the land applied water will be significantly lower than the upper values in Table 5.4-3, since multiple well fields typically will undergo production and groundwater restoration at the same time, and thus the quality of water land applied will be a blend of water from multiple well fields, each somewhere between baseline and end-of-production values. Assuming that the end-of-production TDS is 3,000 to 4,500 mg/L and that typical land application water quality will be halfway between this range and the baseline concentration of about 1,200 mg/L, the typical land application water quality is anticipated to have a TDS of 2,000 to 3,000 mg/L.

Figure 1. Baseline Soil Salinity Profiles - Burdock Land Application Area

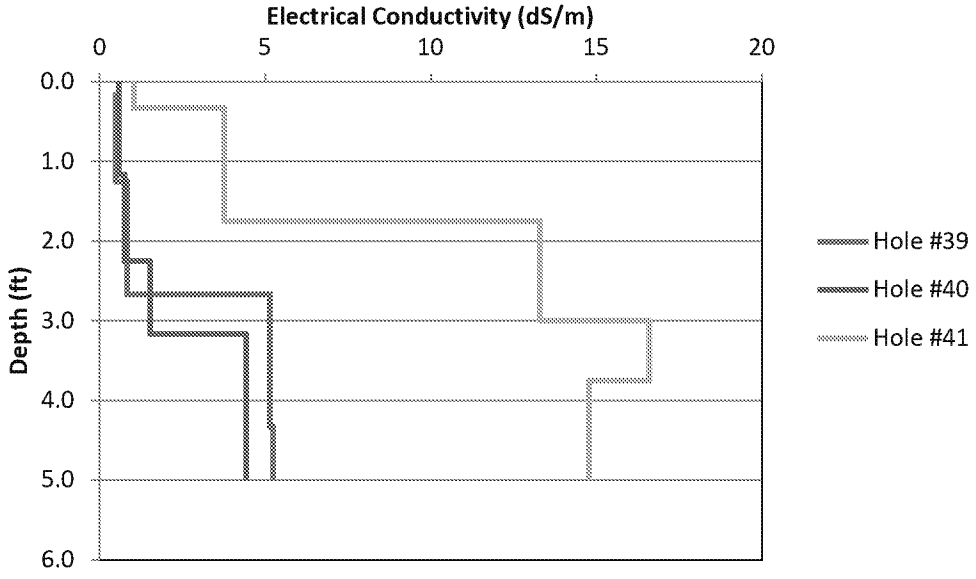


Figure 2. Baseline Soil Salinity Profiles - Dewey Land Application Area

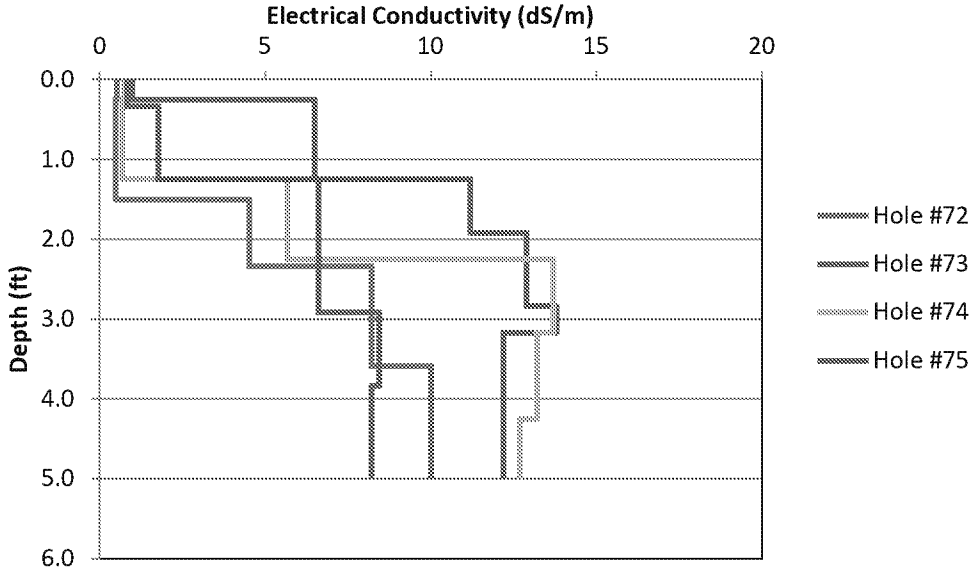


Table 4. Estimated Volume of Land Application Water from Various Sources

Source	Total Volume (acre-feet)	Percent of Total
Groundwater Restoration[1]	1,666	61%
Production Bleed[2]	903	33%
Central Plant[3]	155	6%
Total	**2,724**	**100%**

[1] Appendix 5.6-A, Table 6-1
[2] Estimated as 8,000 gpm maximum gross production rate x 0.875% typical bleed x 8 years
[3] Estimated as 12 gpm x 8 years

Leaching Practices

As described in Section 5.6.2.2, the primary control for soil salinity will be leaching salts below the root zone. Powertech will operate the land application systems to balance the downward migration of water, which has the potential to impact alluvial groundwater, with the leaching that will be used to control salt buildup in the root zone.

Leaching is a well-understood and primary management practice to control soil salinity in the root zone and will be implemented at the Dewey-Burdock Project. Leaching will be used to flush salts out of the root zone before they build up to levels that might affect reclamation success. This may be done using either or both of two primary management procedures:

- Applying land application water at a greater rate than the crop requirement (while also ensuring that the water does not accumulate in catchment areas during dry conditions, in accordance with GDP permit conditions)
- Applying fresh water from the Madison Limestone in conjunction with land applied water

The availability of Madison water for leaching is demonstrated by comparing the maximum requested Madison appropriation amount (551 gpm) with the actual anticipated usage for groundwater restoration and facility usage. As shown in Table 4, the total estimated volume of water extracted during groundwater restoration is 1,666 acre-feet. Since an approximately 1% restoration bleed will be maintained, the estimated requirement of Madison water during restoration is 99% of this amount or 1,649 acre-feet. Over 6.25 years of estimated groundwater restoration (see Figure 5.2-1), this equates to an average requirement for groundwater restoration of 164 gpm. With another 12 gpm used to supply water to the CPP and other facilities (Section 5.6.3.1.1), the total typical requirement is approximately 176 gpm or about 32% of the proposed appropriation. This demonstrates that several hundred gpm of water from the Madison typically will be available under the Madison appropriation if needed for leaching. However, the quantity of Madison water typically used for leaching will be much lower as discussed next.

The quantity of Madison water potentially used for leaching will be relatively small compared to the requested Madison appropriation as demonstrated by the following calculations. As shown in Table 4, the total volume of land applied water is estimated to be 2,724 acre-feet. Over approximately 6 years of concurrent production and restoration (see Figure 5.2-1), this equates to an average annual volume of 454 acre-feet. At an average application rate of 19 inches per year (Section 5.4.1.1.2), the required land application area is approximately 287 acres, or less than half of the proposed maximum primary center pivot area (630 acres). This is an important point to emphasize in terms of potential salinity impacts. The land application systems have been conservatively oversized to handle the peak wastewater generation rate. Under the typical usage scenario, less than half of the design primary pivot area may be required to be under active land application. Therefore, the scope of the potential impacts may be much smaller than if the entire permitted land application area were used regularly. Assuming that 6 inches of Madison water are applied to 300 acres actively irrigated each year, the estimated Madison usage would be 150 acre-feet per year, or only about 17% of the requested maximum annual appropriation volume of 888.8 acre-feet. The 6-inch estimate is based on a rule of thumb that 6 inches of water will leach approximately 50 percent of the salts from the top 1 foot of soil (California Plant Health

Association, 2002). The actual quantity of Madison water used for leaching would be determined during operations based on the annual soil sampling results, quantity of land applied water, type of crops grown, and annual precipitation.

Some leaching will occur each year through infiltration of precipitation. Leaching efficiency will be enhanced with the use of modern sprinkler technology, including nozzles suspended low over the fields that use low pressure to produce relatively large water droplets, resulting in lower evaporation rates and higher efficiencies. This type of sprinkler system will be required by GDP permit conditions requiring Powertech to minimize the formation of aerosols. Section 5.6.2.2 has been modified to include the following mitigation methods to improve leaching efficiency if needed to control salinity (Ayers and Westcot, 1994):

- Leaching during the cool season when evapotranspiration losses are lower
- Using tillage, including potentially deep tillage if needed
- Applying water intermittently, which favors unsaturated flow that is more efficient than saturated flow for leaching

Reclamation Crop Salinity Tolerance

Table 5 presents the salinity tolerance of the five species of grasses in the reclamation seed mixture. The salinity tolerance ranges from moderately tolerant (two wheatgrass varieties) to moderately sensitive (little bluestem). Since the primary goal of salinity management will be successful reclamation of land application areas, these tolerances will be considered when managing the land application systems.

Table 5. Salinity Tolerance of Reclamation Seed Mixture Species

Species	Salinity Tolerance	Source
Western wheatgrass	moderately tolerant	Ayers and Westcot, 1994
Sideoats grama	moderately sensitive to moderately tolerant	Wynia, 2007
Slender wheatgrass	moderately tolerant	Ayers and Westcot, 1994
Green needlegrass	moderately sensitive to moderately tolerant	Taylor, 2001
Little bluestem	moderately sensitive	Ayers and Westcot, 1994

Evaluation of Potential for Saline Seeps

According to the USDA-NRCS (1983), a saline seep is defined as, "Intermittent or continuous saline water discharge, at or near the soil surface downslope from recharge areas under dryland conditions, that reduces or eliminates crop growth in the affected area because of increased soluble salt concentration in the root zone." The following evaluates the potential for the development of saline seeps as result of land application and presents monitoring and mitigation strategies for potential saline seeps.

A variety of factors make it unlikely that saline seeps will occur as result of land application, including:

- Topography - Most planned center pivots, including all Dewey-area center pivots, are located a significant distance from the nearest topographic relief (typically drainage channels) where saline seeps could potentially occur. Most of the ephemeral drainage channels in the Burdock area are relatively shallow and, with the exception of one

planned ephemeral channel diversion (see Section 5.3.9.1), the channels are located a significant distance from the planned center pivots.

- Water table - Saline seeps typically are associated with shallow water table conditions, which are not typically present near the planned land application areas.
- Bedrock - Saline seeps typically are associated with low-permeability geologic outcrops. Such outcrops are not found in the ephemeral stream channels near the land application areas.
- Recharge - The design land application rate is 19 inches per year, which will result in limited leaching. As described previously, management of the land application systems will balance leaching requirements for root zone salinity control with a moderate application rate to limit potential impacts to groundwater.
- Duration - The duration of land application will be limited, after which the recharge to center pivot areas will revert to precipitation and snowmelt. The estimated duration of peak land application, during concurrent production and groundwater restoration, is approximately 6 years as shown on Figure 5.2-1.

Monitoring systems described in the LSM permit application and GDP will be used to determine the potential for saline seeps to occur. These include tracking the land application rate, monitoring salinity in land application area soils, monitoring water movement through the vadose zone through suction lysimeters, and inspecting catchment areas and land application areas for erosion or leakage. In addition, Powertech will include in each annual land application report an evaluation of the potential for saline seeps (see revised Section 5.7.2.6). This evaluation will include annual surveys of drainage channels near the land application areas for signs of potential saline seeps such as changes in plant species (e.g., increasing presence of foxtail barley), soil/subsoil moisture, salt crystals on the surface, and sloughed hillsides. Should the annual survey show the potential development of a saline seep, Powertech will perform a detailed evaluation, including delineating the extents of the affected area through soil sampling and vegetation surveys. The detailed evaluation will include an assessment of the potential cause and mitigation strategy if caused by land application.

A site-specific mitigation plan will be developed for DENR review and approval if a saline seep occurs. Mitigation will focus on two key areas: recharge and seep reclamation. In terms of recharge, the mitigation plan will address modifying the land application rate in the vicinity of the seep, either through rotating active pivots or reducing the application rate. The effectiveness of recharge mitigation measures will be assessed through water table monitoring. Potential mitigation measures for the affected area of a saline seep include temporarily planting salt-tolerant grasses such as tall wheatgrass in the affected area and grading the area (e.g., temporarily or permanently diverting an ephemeral drainage around the affected area).

In the mine permit application, Powertech proposes trigger points for arsenic and selenium of the baseline average concentration plus two standard deviations. However, the department wants Powertech to develop more specific trigger points for arsenic and selenium as well as other metals, sodium, chloride, and SAR.

Response: Based on clarification received during a March 12, 2013 conference call, Powertech understands that this comment specifically refers to soil trigger values and that the "other metals" in the comment refer to lead, molybdenum and uranium. Section 5.5.6.1 has been modified to include the commitment to establish additional trigger values for land application area soils as listed in Table 6, which is incorporated into the LSM permit application as Table 5.5-7. Proposed trigger values for trace and minor elements are all tied to the baseline concentration and variability as with arsenic and selenium. The trigger value calculations will yield values that are within or close to the range of baseline concentrations, ensuring that the concentrations do not change significantly during land application. For chloride, the proposed trigger value is 250 mg/L (7 meq/L). This value is in the middle of the range of 4-10 meq/L recommended for slight to moderate restriction on use for surface irrigation (California Plant Health Association, 2002). Chloride is a constituent of concern for reclamation and will be managed along with general root zone salinity as described previously. For SAR, the proposed trigger value is 10. Figure 3 plots this value along with the anticipated typical land application water EC (3 to 4 dS/m based on a typical TDS range of 2,000 to 3,000 mg/L) on a diagram showing the potential SAR impacts to the infiltration rate. Figure 3 shows that no impacts are anticipated to the soil infiltration rate at SAR 10 or less.

Table 6. Trigger Values for Land Application Area Soils

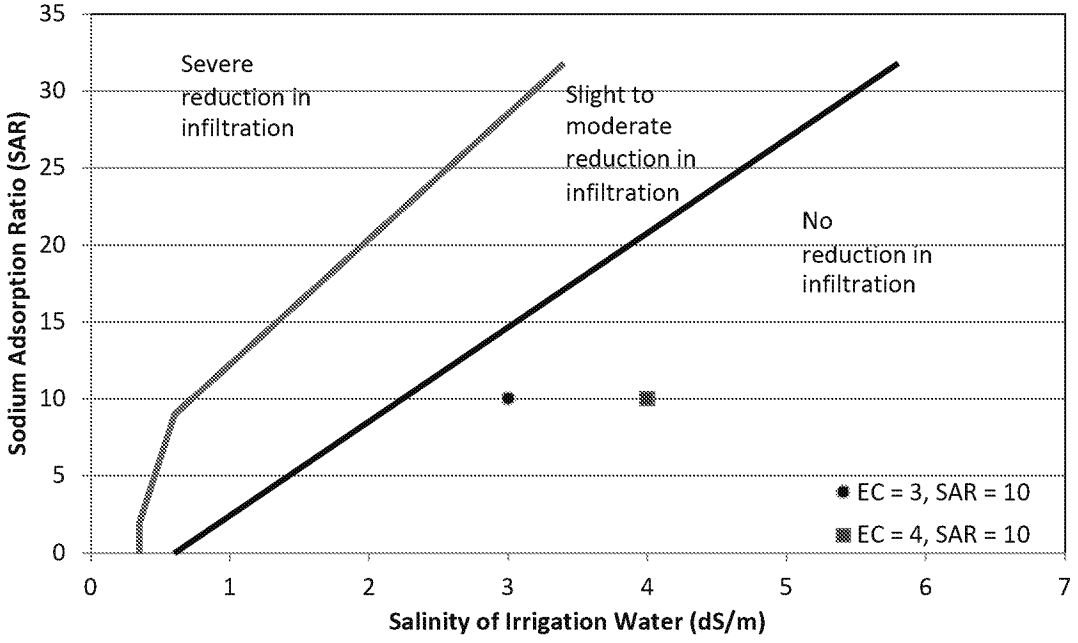
Parameter	Units	Trigger Value
Arsenic	mg/kg-dry	Baseline average concentration plus 2 standard deviations
Lead	mg/kg-dry	Baseline average concentration plus 2 standard deviations
Molybdenum	mg/kg-dry	Baseline average concentration plus 2 standard deviations
Selenium	mg/kg-dry	Baseline average concentration plus 2 standard deviations
Uranium-natural	mg/kg-dry	Baseline average concentration plus 2 standard deviations
Chloride	mg/L	250
SAR	unitless	10

Powertech does not propose to conduct baseline soil sampling in order to establish trigger values prior to permit issuance for the following reasons:

1) Powertech is committed to sampling land application area soils prior to operation as described in Section 5.5.6.1. Results will be provided to DENR along with calculated trigger values for agency review and approval prior to land application. Trigger values for metals/metalloids will be established according to baseline concentrations and variability, and the land application systems will be operated and monitored to ensure that these concentrations do not increase significantly.
2) Land application is the secondary wastewater disposal option and will not be used if sufficient capacity is available in deep disposal wells. If land application is not used, there will be no use for the relatively expensive baseline soil sampling data from land application areas.

3) Minor grading may be performed in the land application areas, potentially resulting in different soil horizons than baseline sampling if conducted prior to grading. Section 5.4.1.1.2 describes how Powertech will evaluate the need for grading during final design of the land application systems and catchment areas.
4) Final design of land application systems could result in revisions to the locations, which may not encompass baseline soil sampling locations conducted prior to final design.

Figure 3. Sodium Adsorption Ratio (SAR) Hazard



Source: California Plant Health Association (2002)

In response to comment #9 several changes have been made to the LSM permit application. The following sections were added:

- 5.5.4.2 Catchment Area Water Quality Monitoring
- 5.5.4.3 Soil and Vegetation Monitoring (including new Table 5.5-6)
- 5.5.4.4 Livestock Monitoring
- 5.5.4.5 Prairie Dog Monitoring
- 5.5.4.6 Groundwater and Surface Water Monitoring

In addition, text in the following sections was modified:

- 5.5.4
- 5.5.6.1 (including new Table 5.5-7)
- 5.5.8
- 5.5.9
- 5.6.2.2

10. Section 6.3.1.4 and Section 6.3.2.2, page 6-13: Will any of the removed contaminated soils underneath ponds and well houses be replaced at a 1:1 ratio with uncontaminated soils from another source?

Response: Sections 6.3.1.4 and 6.3.2.2 address reclamation of the ponds and header houses, respectively. These sections describe how during reclamation, the subsoil underneath the pond liners and under and around the header house foundations will be surveyed for contamination. Any materials which do not meet the limits for unrestricted use will be disposed at a licensed disposal facility. Following the surveys and removal of contaminated subsoil (if present), areas formerly excavated for pond construction and header house installation will be backfilled with spoil previously stockpiled from these areas.

The ratio of backfill to excavated spoil material is expected to be approximately 1:1, since there is very low potential for the subsoil around the ponds and header houses to become contaminated. Protective measures to guard against pond leaks are described in Section 5.6.5.1.4 and include liners, leak detection systems for ponds containing untreated wastewater, routine inspections, and SOPs to rapidly dewater a pond if a leak occurs. All ponds will be provided with at least one geosynthetic liner underlain by a clay liner. Ponds containing untreated wastewater, which would have a greater potential to contaminate subsoil if a leak were to occur, will have two geosynthetic liners, a clay liner, and a leak detection system. Routine inspections described in Section 5.3.4.5 include daily inspections of pond liners, daily inspections of pond freeboard to ensure adequate capacity is available, and daily checks for water accumulation in leak detection systems. The potential impacts from a primary liner leak will be minimized by implementing SOPs to take the pond out of use and remove its contents to another pond (refer to the response to comment #2). Sufficient freeboard will be maintained in each type of pond such that the contents of a leaking pond can be transferred to another pond with the same level of lining system. Based on these protective measures, the financial assurance estimate in Appendix 6.7-A was prepared assuming the secondary liners and leak detection systems will not be contaminated. Therefore, the volume of contaminated subsoil requiring removal is assumed to be zero or nearly zero for each pond. It is not anticipated that spoil will have to be borrowed to make up for contaminated subsoil removal.

The subsoil around header house foundations similarly is not expected to require removal due to contamination. Plate 5.3-4 shows how each header house will include a concrete foundation that will contain a leak if it were to develop in the header house piping. Section 5.3.5 describes how each header house will be equipped with external and internal shutdown controls for automatic and remote shutdown in the event of an upset condition such as a pipe break. This section also describes how each header house will include a sump equipped with a water level sensor to alert operators to a leak and automatically shut down the header house. All visible pipes and fittings inside each header house will be inspected daily for potential leaks. These measures will help prevent a leak from affecting the subsoil around the header house foundation. Therefore, the volume of contaminated soil or subsoil around header houses is anticipated to be very low and not require spoil to be borrowed to make up for contaminated soil or subsoil removal. No changes were made to the LSM permit application in response to this comment, since the response clarifies information contained in the application.

11. *Section 6.3.3, page 6-14: Will Powertech keep records of GPS locations of all wells after well plugging is completed to assist in locating the wells during future inspections of the mining area, including postclosure inspections?*

Response: Section 5.7.2.5 has been revised to include the commitment to retain records of the locations of all wells, including injection, production, and monitor wells, throughout the postclosure monitoring period. Well locations will be determined using a survey-grade GPS or equivalent.

12. *Appendix 5.3-A: Regarding the 40 mil liners mentioned in the Appendix, the department suggests using 40 mil LLDPE liners or 60 mil HDPE or LLDPE liners for better puncture resistance. Our experience with 40 mil HDPE liners is that they are prone to punctures and other damage.*

Response: Powertech appreciates the suggestion and will consider using 40 mil LLDPE or 60 mil HDPE liners for ponds with one geosynthetic liner (i.e., ponds that store only treated wastewater such as the treated water storage ponds and spare storage ponds, noting that ponds storing untreated wastewater or used in the water treatment process have been designed with 80 mil primary and 60 mil secondary liners). From the comment and the subsequent clarification of the concerns, Powertech understands that DENR has witnessed problems with 40 mil HDPE liners after many years of service, primarily due to ice. Prior to construction, Powertech will evaluate the relative costs and benefits of the alternate liners and decide whether to include them in the construction plans and specifications. Powertech also has added the commitment to provide as-constructed drawings of the ponds to DENR. Meanwhile, following is a brief summary of the protective measures that will minimize the potential liner damage regardless of the type of liner selected.

Appendix 5.3-B (Pond Construction Specifications, Testing and QA/QC Procedures) describes the liner specifications, installation procedures, and extensive testing procedures. Part 2 - Geosynthetics, Section 4.3 describes the geosynthetic liner specifications. Liners will be UV resistant and provided with a minimum warranty period of 20 years by the contractor. Appendix 5.3-B, Part 2, Section 6.0 describes how the manufacturer will be required to test random samples during production of the pond liners and submit the results to the construction oversight engineer, who will be a South Dakota-licensed professional engineer or an engineer working under the direct supervision of a licensed professional engineer. In addition, the engineer will collect conformance samples of the liner materials delivered to the site and test these for thickness, density, tensile properties, and general conformance with specifications.

Appendix 5.3-B, Part 1 - Earthworks, Section 5.1.2 addresses preparation of the areas to receive geosynthetic liners. In ponds with one geosynthetic liner, these areas will be clay liners at least 12 inches thick. Prior to installing the geosynthetic liner, the clay liner surface will be moistened and proof rolled with a smooth drum roller or similar equipment to ensure that the surface is firm and smooth. Part 2, Section 5.3 requires the area where the liner is installed to be free of sharp particles, rocks, or other debris to the satisfaction of the engineer. Sharp objects will be removed by raking, brooming, or hand picking as necessary. This will ensure that there is minimal potential for punctures during or after installation. The contractor will be required to provide a

supervisor with significant experience in installing flexible lining materials to supervise installation. Care will be taken during installation to minimize the potential for damage or future leaks. Specific requirements include laying out panels to minimize the number of seams, limiting foot traffic, and repairing or replacing any damaged areas during installation.
Part 2, Section 6.0 describes the extensive quality control requirements for geosynthetic liners. These include the previously mentioned random samples by the manufacturer during production, visually inspecting each seam during installation, and testing all seams completed in the field. Any defective seams will be cut out and replaced or patched with an overlying cap. Testing will be conducted on the repaired area to ensure that all seams are installed properly.

During operation, the liners will be protected from damage from wildlife through perimeter fences installed around all lined ponds, including small mammal provisions as discussed in the response to comment #GFP-1(a). Ice formation will be limited by continuously filling the ponds during the winter (treated water storage ponds), passing water through the ponds year around (outlet ponds and surge ponds), or keeping the ponds empty (spare treated water storage ponds). Section 5.3.4.5 in the LSM permit application describes how the pond liners will be inspected daily. Should a leak occur, sufficient capacity will be available in a spare pond to rapidly transfer the contents of the leaking pond in order to make repairs.

13. *Plate 5.3-1, Sheet 1 and Plate 5.3-2, Sheet 1: The topsoil stockpiles shown in these plates appear to be located too close to the ponds. Please submit revised plates with topsoil stockpiles located farther away from the ponds.*

Response: After receiving clarification on this comment, Powertech understands that the concern is with the topsoil stockpiles in the Dewey area. Powertech has revised the topsoil stockpile location in the Dewey area for the land application option as depicted on revised Plate 5.3-1, Sheet 1. The revised location is farther from the ponds and from a drainage channel. As described in Section 5.3.7, topsoil stockpiles will not be located in any drainage channels or other locations subject to flooding. Berms will be constructed around the perimeter of stockpiles to capture runoff and sediment resulting from direct precipitation on the stockpiles and to prevent erosion from runoff.

14. *Plate 5.3-5, Sheet 1: Powertech needs to show that the existing access road from the Dewey Road to the Dewey Satellite Plant will be upgraded to a primary access road. The current map does not show this road being upgraded. Also, will the primary access be used exclusively by the mining operation?*

Response: Plate 5.3-5, Sheet 1 has been updated to extend the Dewey satellite facility primary access road to the permit boundary. This change also is reflected on revised Plate 5.3-1, Sheet 1 and Plate 5.3-2, Sheet 1. Existing roads will be used and upgraded as needed from the S. Dewey Road to the primary access road. These roads will not be used exclusively by the mining operation. The existing roads will be used to access the residence in Section 30, T6S, R1E (currently unoccupied) and for ranch access.

15. *Plates 5.4-1 and 5.4-2: On each plate, please show the wetted perimeter of the normal operating level behind each catchment berm. Also, please show the location of the excess water level markers and the pumps and piping for the excess water. Are there any plans to pump water from the normal operating level if increasing Se, As, SAR, or other trends are noted? Finally, please submit electronic versions of Plates 5.4-1 and 5.4-2 in dwg or ArcMap format.*

Response: Plates 5.4-1 and 5.4-2 have been revised to show the wetted perimeter of the normal operating level. These plates, which were formerly provided along with the requested copies of GDP permit application comment responses, are now being incorporated as LSM permit application plates using the same plate numbers. In addition, Section 5.4.1.1.2 has been revised to reference these plates and discuss catchment area operation. It is important to note that the land application systems will be operated in accordance with GDP permit conditions, which will not allow land applied water to accumulate in the catchment areas during dry conditions. Therefore, the "normal operating level" represents the maximum level allowed to fill with runoff and snowmelt while still maintaining adequate freeboard for the 100-year, 24-hour runoff event. The catchment areas will not be used to store land applied solutions and only will contain water following rainfall or snowmelt events. The normal operating level will be delineated with a clearly visible marker such as a t-post, which will be installed on the catchment berm or another highly visible location.

In some cases, more than one catchment area may be required to contain the 100-year, 24-hour runoff volume. The conceptual catchment area designs in Plates 5.4-1 and 5.4-2 indicate where this might occur. For example, conceptual catchment areas B-11 and B-12 are designed such that overflow is routed to catchment area B-13. In these cases, there will not be a designated normal operating level in the upgradient catchment areas. Any time runoff or snowmelt accumulates in a catchment area without a designated normal operating level it will be dewatered to a downgradient catchment area with a designated normal operating level. It is anticipated that dewatering will occur via gravity discharge through a pipe with the inlet invert elevation at the bottom of the upgradient catchment area. In this case flow would be controlled by a manual valve, normally closed, in the discharge pipe. Following a rainfall or snowmelt event, the valve would be opened and the water drained to the downgradient catchment area at non-erosive velocity. Other alternatives may include pumping or water trucks. As described in Table 1.1-2 under ARSD 74:29:05:14(1), as-constructed plans of the land application systems, including catchment area dewatering systems, will be provided to DENR prior to operation.

If a catchment area fills above the normal operating level, a dewatering program will be initiated. The catchment area will be dewatered, with the excess water conveyed to another catchment area with excess operating capacity or the storage ponds, or pumped to a land application pivot area (primary or standby area). It is anticipated that pumps will be installed in the most downgradient catchment areas, with pump discharge piping routed to the storage ponds. In this case the piping would be installed in the same corridor as the pipelines from the ponds to the pivot areas wherever possible. These pipelines have been added to Plates 5.4-1 and 5.4-2. Alternately water trucks may be used in some circumstances to dewater catchment areas and transfer the contents to the storage ponds or another catchment area. If water trucks are to be used, Powertech will

demonstrate in the as-constructed land application system plans that the catchment areas can be dewatered in a timely manner.

Please note that the conceptual catchment area design in the Dewey area has been revised. The former catchment area D-10 conflicted with the primary access road to the satellite facility. Therefore, the conceptual design for D-10 has been modified and a new catchment area (D-15) has been added. These changes are reflected on the revised Plate 5.4-1. Plates 5.4-1 and 5.4-2 will be provided electronically under separate cover in AutoCAD .dwg format as requested.

To address DENR's comment regarding dewatering catchment areas in the event of increasing concentrations of water quality constituents and to ensure that the water in the catchment areas does not pose a threat to groundwater or wildlife, Powertech proposes to sample the water in catchment areas monthly (when present) and initiate mitigation measures if the water quality exceeds trigger values. Section 5.5.4.2 was added to address catchment area monitoring. Table 7 (added to Section 5.5.4.2 as Table 5.5-6) summarizes the proposed trigger values. The proposed trigger value for EC (4,000 µmhos/cm) is the upper range of the typical land application estimate described previously. The proposed trigger value for SAR is the same as the soil trigger value addressed above. For metals/metalloids, the proposed trigger values are obtained from Raisbeck et al. (2007). These are water quality recommendations protective of livestock and wildlife based on extensive literature review. Parameters listed in Table 7 without trigger values are proposed for monitoring only. If the concentration of any parameter exceeds the trigger value, Powertech will dewater the catchment area as described previously.

By committing to not allowing land application solutions to accumulate in the catchment areas during normal operations, establishing catchment area water quality trigger values and dewatering catchment areas if trigger values are exceeded, the concentrations of constituents in the catchment area soils are not expected to increase significantly. This will be verified through the commitment to sample catchment area soils annually and implement mitigation measures if significant increases in constituent concentrations are observed (see Section 5.5.6.1).

Appendix 1.0-B (Technical Revision List) has been changed to specify that trigger values as well as compliance limits may be modified by technical revision subject to DENR approval.

Table 7. Proposed Sample Parameters and Trigger Values for Water in Catchment Areas

Parameter	Unit	Trigger Value
EC	µmhos/m	4,000
SAR	unitless	10
pH	s.u.	<6.5 or >8.5
Arsenic[1]	mg/L	1
Copper	mg/L	---
Lead	mg/L	---
Molybdenum[1]	mg/L	0.3
Selenium[1]	mg/L	0.1
Uranium[2]	mg/L	0.2
Vanadium	mg/L	---
Zinc	mg/L	---
Gross alpha	mg/L	---
Radium-226	mg/L	---

[1] From Raisbeck et al. (2007)
[2] From Canadian Livestock and Water Quality Guidelines *in* Raisbeck et al. (2007)

Department of Agriculture Comments

Ag-1. Appendix 6.4-C Noxious Weed Control Plan Page 6.4-C-1: In Line 1, the timing statement of the proposed noxious weed inspection is insufficient. Annual inspections should be performed during the active growing season of the weeds. Also, under "Herbicides", the herbicide use and application statement is insufficient. Herbicide application must be performed by South Dakota Certified Licensed Pesticide Applicators. Powertech (USA) must follow all grazing and haying restrictions noted on the product label.

Response: Appendix 6.4-C has been revised as requested to clarify that weed inspections will be performed during the active growing season of the weeds and that herbicide application will be performed by a South Dakota-certified licensed pesticide applicator. The appendix also has been revised to include the commitment to follow all grazing and haying restrictions noted on the herbicide label.

Ag-2. Appendix 6.4-C Noxious Weed Control Plan Page 6.4-C-3, Table 1, Custer County Noxious Weeds: The Custer County noxious weed list is incomplete. White Horehound (Marrubium vulgare) was added to the list by emergency declaration in August 2012 (See Custer County Weed & Pest Board Archive meeting minutes, August 1, 2012: [HYPERLINK "http://www.custercountysd.com/wp-content/uploads/2011/01/Bdmtg080112.doc" \h]
(page 2)).

Response: Appendix 6.4-C, Table 1 has been revised as requested to include white horehound.

Ag-3. *Appendix 6.4-C Noxious Weed Control Plan Page 6.4-C-4, References: The references to SDSU 2010 Weed Control in Pasture and Range is outdated. Please use South Dakota State University Extension, 2013 Weed Control, Pasture and Range: 2012 SDSU Extension, available on the internet as of January 2013:* [HYPERLINK "http://igrow.org/up/resources/03-3020-2012.pdf" \h]

Response: The references in Appendix 6.4-C have been revised as requested to use the 2013 South Dakota State University Extension reference.

Custer Conservation District Comments

CCCD-1. *Land Reclamation Plan: What is the timing and methodology for reclaiming all exploration drill holes? What species will be planted and what will the soil material be?*

Response: Well field reclamation will be carried out in an ongoing process concurrently with ISR operations. Section 6.5 in the LSM permit application describes the reclamation timetable and shows that each well field will be reclaimed following uranium recovery operations. During exploration and delineation drilling, each hole will be plugged according to South Dakota standards before the drilling rig leaves each location. Following construction of the processing facilities, pipelines, and each well field, interim reclamation using the approved seed mixture will be used to temporarily stabilize areas to be disturbed again (see Section 6.4.2). Groundwater will be restored following uranium recovery in each well field. Following regulatory approval of successful groundwater restoration and stability monitoring, wells will be plugged and abandoned, well field pipelines and header houses will be removed, and surface disturbance areas will be reclaimed with the approved reclamation seed mixture.

The postmining land use for the vast majority of disturbed areas will be rangeland. Disturbed areas designated to be reclaimed to rangeland will be reseeded with a permanent seed mixture (see Table 6.4-1). This seed mixture was recommended by the local NRCS office (see Appendix 6.4-B) and approved by all surface owners within the proposed permit area (see Appendix 6.4-A). The reclamation seed mixture will contain western wheatgrass, sideoats gramma, slender wheatgrass, green needlegrass, and little bluestem. Only a small area of cropland is planned to be disturbed. Disturbed cropland will be planted with alfalfa during reclamation. Refer to the following comment response for a description of topsoil handling.

What is the timing and species being used to stabilize the topsoil piles? Also, what is the quantity of soil in each of the stockpiles?

Response: Topsoil stockpiles will be stabilized by seeding with the approved reclamation seed mixture during the first normal period of favorable planting conditions (see Section 6.4.3.4 of the LSM permit application). The estimated topsoil stockpile volumes for the processing facilities and ponds are 100,000 to 200,000 cubic yards in the Burdock area and 50,000 to 100,000 cubic yards in the Dewey area. Additional topsoil stripped during access road and well field

construction will be stockpiled near the access roads and well fields. See Section 5.3.7 in the LSM permit application for further details.

Will all locations be reseeded with the single seed mix, regardless of post mining soil analysis?

Response: A single seed mixture will be used for all interim and final reclamation, except that a small area of cropland disturbance will be restored to alfalfa cropland (see Section 6.4.3.4 of the LSM permit application).

The soil analyses indicate areas of high pH, high conductivity, and SAR values that indicate potential problems. Will these soils be identified during the topsoil stripping process?

Response: Section 6.4.3.2 in the LSM permit application describes how Powertech will analyze topsoil prior to stripping in the processing areas and first well fields to determine whether fertilizer or other amendments will be required to establish and sustain vegetative growth during reclamation. See also Section 6.4.3.4 for a discussion of areas with low vegetative cover densities that likely will have low revegetation potential if disturbed. These include the Darrow Mine surface pits/spoil piles and the "alkali area," which is an isolated area of groundwater discharge to the surface potentially as result of historical exploration drilling. In only very limited areas, which are anticipated to include the historical mine pits and the alkali area (in addition to the processing areas and first well fields discussed previously), Powertech will sample the topsoil and subsoil prior to disturbance. If the evaluation demonstrates that its chemical or physical characteristics would seriously inhibit plant growth and that it is not feasible to remedy by chemical treatment, overburden replacement, or like measures, Powertech will request that the revegetation performance criteria not apply for these limited areas as allowed by SDCL 45-6B-46(2). In all other areas, revegetation will be required to meet the reclamation performance criteria in Appendix 6.4-D. For rangeland, Powertech will be required to demonstrate that reclamation performance criteria are met for vegetative cover, usable forage production, species composition, and sustainability of reclamation to DENR's satisfaction prior to final bond release.

CCCD-2. Land Application Plan: We note that much of the surface water analysis shows high salt content indicating the surrounding soils also are saline.

Response: The response to comment #9 addresses the baseline salinity levels in the land application area soils and mitigation of potential salinity impacts. It describes how the top 1 to 3 feet of the soils typically are non-saline, while deeper soils have considerably higher salinity levels. The salinity levels will be managed in the land application areas by leaching. This may include applying land application water at a greater rate than the crop requirement or applying fresh water from the Madison in conjunction with land applied water. Leaching may be enhanced by applying excess water during the cool season, tillage (including deep tillage), and applying water intermittently. Please note that discharge to surface water from land application systems will not occur. Catchment areas will be constructed downgradient of land application areas to capture runoff up to a 100-year, 24-hour storm event.

Water from the deep wells also indicates properties that would make reclamation more difficult.

Response: The response to comment #9 addresses the anticipated range of salinity in the land application water. Salinity will be managed during land application by adjusting the leaching rate and leaching with fresh water from the Madison as needed in order to ensure that land application areas can be reclaimed.

The areas on the Land Application Exhibits showing where the excess water will be applied has soils that are thin and on the heavy texture side of the triangle.

Response: The LSM permit application (Section 5.4.1.1.2) describes how the soil hydraulic properties in the land application areas will help prevent the migration of water into the alluvial groundwater. Soil sampled from test pits in and around the land application areas predominantly contain clay and silt, with lesser amounts of sand and virtually no gravel to depths of 7 to 10 feet. The hydraulic modeling simulations used to size the land application systems considered permeability measurements from soil samples collected in the land application areas. These simulations predict that the land applied water will not percolate deeper than 8 feet. An important factor in limiting deep percolation will be applying land application water at an agronomic rate of about 19 inches per year. As described in the response to comment #9, the land application system operations will be balanced to limit deep percolation to groundwater while also leaching salts from the top 1 to 3 feet to maintain root zone salinity levels conducive to reclamation.

We are concerned that there will be a buildup of salts in the soil profile which would make revegetation unsuccessful.

Response: Please refer the response to comment #9 and the above comment responses for a description of mitigation measures to control salinity levels in land application soils.

If indicated through analysis, will more appropriate species and soil amendments be applied to help ensure long term land use?

Response: Section 6.4.3.4 in the LSM permit application describes how areas seeded with the reclamation seed mixture will not be treated with any type of soil amendment or irrigated to improve reclamation success unless required in the land application areas. Section 6.4.4 describes revegetation of land application areas. The revegetation technique will depend on the vegetation grown in the land application areas. If native vegetation is irrigated and the species composition of the native vegetation does not change significantly during irrigation, then reseeding is not anticipated to be necessary to meet the reclamation performance criteria. However, if the species composition significantly changes during the course of land application or if crops such as alfalfa or wheatgrass are planted in the land application areas, Powertech will revegetate land application areas using the permanent reclamation seed mixture described previously, prepare a revegetation plan approved by appropriate agencies, or demonstrate that that after land application ceases a permanent, self-perpetuating ground cover at least equal in character and extent to the original will remain.

South Dakota Department of Game, Fish and Parks (GFP) Comments[HYPERLINK \l "_bookmark0"]

5.3.4 Ponds
5.3.4.1 Pond Design, Appendix 5.3-A

Comment GFP-1: Pond designs do not address wildlife protection. Add the components into design specifications.

- *GFP-1(a): Fencing: mesh and height for large and small mammal exclusion.*

Response: Section 5.6.11.2 in the LSM permit application has been revised to specifically address pond fencing to exclude large and small mammals. Chain link fences around the facility ponds will be 8' high to exclude large mammals, as shown in the drawings in Appendices 5.3-A and 5.3-B. Powertech commits to installing durable mesh (e.g., woven wire) along the base of the chain link pond fencing for small mammal exclusion. The mesh will extend at least 30 inches above ground and will be buried at least 3 inches to ensure there are no gaps and to discourage burrowing. Section 5.3.4.5 has been revised to indicate that ponds will be inspected daily for wildlife presence or sign of potential wildlife intrusion.

- *GFP-1(b): Bird and wildlife access: level of metals concentration in solution of contained ponds in which ponds will be covered to prevent contact with wildlife.*

Please refer to the response to comment #15 for a discussion of trigger levels in the catchment areas that will trigger dewatering. For the facility ponds, Section 5.6.11.2 has been revised to describe how Powertech will provide an avian deterrent system (physical deterrent such as netting or "bird balls" or hazing system) for ponds used to store untreated water or used in the water treatment process. These are the ponds with dual synthetic liners and include the central plant pond, radium settling ponds, spare ponds, and surge ponds. For ponds storing only treated water, including the treated water storage ponds, spare storage ponds, and outlet ponds, avian deterrent systems will be provided if the water quality exceeds trigger values designed to be protective of wildlife. Table 8 (added to the LSM permit application as Table 5.6-2a) lists the proposed trigger values. These include acute aquatic life criteria recommended by EPA under Section 304(a) of the Clean Water Act and 10 CFR Part 20, Appendix B, Table 2, Column 2 limits for release of radionuclides to the environment. Note that for selenium, the EPA criterion uses a formula that recognizes that selenium's two prevalent oxidized forms, selenite (SeO_3^{2-}) and selenate (SeO_4^{2-}), present differing potentials for aquatic toxicity. In order to demonstrate compliance with the trigger value, Powertech will establish the ratios of selenite and selenate to the total selenium concentration in the treated water ponds and apply the formula noted below Table 8. As described in the response to comment #15, Appendix 1.0-B (Technical Revision List) has been changed to specify that trigger values as well as compliance limits may be modified by technical revision subject to DENR approval.

[1] South Dakota Department of Game, Fish and Parks (GFP) comments to the Department of Environment and Natural Resources, attached to October 31, 2012 DENR procedural completeness review letter.

Table 8. Proposed Trigger Values for Avian Deterrent Systems in Treated Water Ponds[1]

Parameter	Units	Proposed Trigger Value
Arsenic	mg/L	0.34 [(2)]
Selenium	mg/L	Formula [(2)(3)]
Uranium	pCi/L	300 [(4)]
Radium-226	pCi/L	60 [(4)]
Lead-210	pCi/L	10 [(4)]
Polonium-210	pCi/L	40 [(4)]
Thorium-230	pCi/L	100 [(4)]

[1] Including treated water storage ponds, spare storage ponds, and outlet ponds.
[2] EPA Section 304(a) aquatic life criteria (EPA, 2013)
[3] Trigger value = 1/[(f1/CMC1) + (f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 0.1859 mg/l and 0.01282 mg/l, respectively (EPA, 2013)
[4] 10 CFR 20, Appendix B, Table 2, Column 2

- *GFP-1(c): Unfenced ponds- provisions to preclude wildlife entrapment*

Response: The only unfenced ponds planned for use at the Dewey-Burdock Project are sediment ponds. As described in Section 5.3.9.3 of the LSM permit application, sediment ponds will be used to capture sediment from disturbed areas within drainage basins of 60 acres or more. They will be designed either as earthen fill dams or incised ponds. Earthen fill dams will pose no risk for wildlife entrapment, since the upgradient channel will be unaffected. Incised ponds will not be constructed at slopes steeper than 3:1 (horizontal:vertical). Powertech does not anticipate that these slopes will pose a risk for entrapment, since they will be unlined and the sediment ponds will not normally store significant quantities of water (Powertech will be required to dewater any sediment pond that fills beyond the designated freeboard capacity required for the 5-year, 24-hour runoff event). Nevertheless, Powertech will design all facilities including sediment ponds and any areas that could accumulate water to avoid wildlife entrapment. Section 5.6.11.2 has been updated to indicate that sediment ponds and any other areas that could accumulate water will be designed to avoid wildlife entrapment.

Table 5.0-2: Regulatory Primacy

Comment GFP-2: Regulatory primacy of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act is the US Fish & Wildlife Service. The Department of Game, Fish and Parks shall enforce the South Dakota laws pertaining to the protection and propagation of all game animals, game birds, fish, and harmless birds and animals; SDCL 41-3-8 and 34A-8-6.

Response: Table 5.0-2 has been revised to indicate that USFWS and GFP have primacy over specific aspects of ecology. A note below Table 5.0-2 has been added acknowledging that USFWS has regulatory primacy of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act and that GFP shall enforce the South Dakota laws pertaining to the protection and propagation of all game animals, game birds, fish, and harmless birds and animals.

5.5 Monitoring

Comment GFP-3: The monitoring and mitigation sections must include wildlife. Develop monitoring plans for:

- *GFP-3(a): Land application: Bioaccumulation of metals in the terrestrial food chain must be evaluated if land application is use for waste disposal.*

Response: If land application is used for disposal of treated wastewater, Powertech will implement an extensive monitoring system to evaluate the potential for bioaccumulation. Existing commitments in the LSM permit application include the following:

- Land applied effluent: Powertech will collect grab samples every few hours and have them analyzed for a short list of parameters that will indicate changes in effluent water quality. Each month, additional samples will be collected and analyzed for a more extensive parameter list to monitor land applied water quality. (See Section 5.5.4.1.)
- Soil monitoring: Powertech will collect soil samples each year from each land application pivot that was active during that year and from each catchment area. The sample results will be compared to trigger values for selenium, arsenic and other constituents (see Section 5.5.6.1 and the response to comment #9). The trigger values will be based on the preoperational concentrations and will be submitted to DENR for review and approval prior to initiating land application.
- Vegetation monitoring: Vegetation samples will be collected each year from the land application areas and catchment areas and compared to trigger values for arsenic and selenium. The trigger values will be based on the preoperational concentrations and will be submitted to DENR for review and approval prior to initiating land application.

Additional commitments are included in these comment responses. Specifically, Powertech will analyze runoff and snowmelt in the catchment areas and dewater the catchment areas if trigger values are exceeded (see the response to comment #15). Selenium also will be added the list of analytes for fish sampling (see the response to comment #GFP-1(e)).

In addition, Powertech proposes to analyze prairie dogs for potential bioaccumulation if land application is used. Prairie dogs were selected since they have been identified as a primary prey source for raptors and especially for the state-listed bald eagle. Powertech proposes to sample three prairie dogs prior to land application and each year during land application. The prairie dogs will be collected as close as possible to the land application systems. The samples will be analyzed for arsenic, molybdenum, selenium, and uranium. The specific sampling methodology (i.e., whole tissue versus specific organs) will be submitted to DENR and GFP for approval prior to initial sampling. Following pre-operational sampling, Powertech will submit trigger values for review and approval by DENR and GFP. Sections 5.5.4.5 and 5.5.9 were added to provide information on monitoring and mitigation of potential impacts to prairie dogs.

Should monitoring results indicate potential impacts to wildlife, mitigation measures will be implemented as described in the response to comment #9. If wildlife exclusion fencing is used around land application areas, Powertech will submit the fence design to DENR and GFP for approval prior to installation.

- *GFP-3(b): Small mammals: Exposure and ingestion of potentially toxic land application solution, soils and vegetation represents a contaminate exposure pathway in the food chain.*

Response: See the previous comment response. Powertech proposes to sample prairie dogs annually to evaluate the potential for bioaccumulation and exposure in the food chain.

- *GFP-3(c): Migratory birds: Exposure risk of toxic levels of metal and metalloids from land application solution storage.*

Response: See the response to previous comments. Powertech proposes to establish trigger values in catchment areas and dewater the catchment areas if trigger values are reached. Trigger values also will be established in treated water storage ponds, above which avian deterrent systems will be used. Avian deterrent systems will be provided in ponds storing untreated water or used as part of the treatment process. In addition, Powertech routinely will monitor land applied water, soil and vegetation and implement mitigation measures if trigger values are exceeded.

- *GFP-3(d): Raptors: annual nest surveys of project area and buffer.*

Response: The avian monitoring and mitigation plan will include a commitment for annual nest surveys. This is anticipated to include annual monitoring of all known raptor nests within the permit area and 0.5-mile perimeter and annual searches for new nests within 0.5 mile of current year disturbance and proposed disturbance for the following year. Please see also the response to December 2012 comment #1.

- *GFP-3(e): Fish: Proposed collection and analysis methods for fish tissue will be consistent with the project's baseline sampling protocols.*

Response: Section 5.5.9 of the LSM permit application has been modified to provide more detail regarding operational fish sampling that will be conducted in accordance with NRC license requirements. These requirements include collecting fish species identified with the potential for human consumption (green sunfish and channel catfish) semiannually if present in water bodies that may be subject to seepage or surface drainage from potentially contaminated areas. It is anticipated that this will include downstream locations on Beaver Creek and the Cheyenne River. In addition to the NRC license-required analyte list of natural uranium, radium-226, lead-210, polonium-210, and thorium-230, fish samples will be analyzed for selenium and the results provided to DENR and GFP.

In addition, Powertech commits to sampling fish and macro-invertebrates in the unlikely event that a spill or leak results in solutions reaching Beaver Creek. Sampling will be conducted according to a sampling and analysis plan approved by DENR and GFP.

5.5.7 Vegetation Sampling
5.5.7.1 Land Application Systems

The application states: Soil and vegetation samples will be collected annually from the land application areas.
Comment GFP-4: The application needs to address concentrations of land applied metals in soil, vegetation and biota in which land application mitigation will occur.

Response: Trigger values for soil and vegetation are addressed in the LSM permit application and these comment responses (i.e., see the response to comment #9). Powertech will establish these trigger values based on the pre-operational concentrations. Trigger values for prairie dogs will be established following pre-operational sampling and submitted to DENR and GFP for review and approval.

5.6.11 Ecological Resources

Comment GFP-5: This section needs to consider facilities becoming an attractive nuisance for wildlife. The species referenced in this section tend to have a high tolerance of human activity and could be attracted to food and water sources created by ponds and land application areas.

Response: Section 5.6.11.2 has been modified to address mitigation measures for potential impacts to wildlife from ponds and land application areas. Methods to address ponds becoming an attractive nuisance for wildlife have been described previously in these comment responses. These include fencing to exclude large and small mammals and avian deterrent systems for all ponds with dual synthetic liners and for treated water storage ponds if the water quality exceeds trigger values.

Powertech does not anticipate that land application areas will pose a risk to wildlife on the basis that water will be treated to meet the standards of release for radionuclides to the environment and will contain low concentrations of metals and trace elements such as arsenic and selenium. Potential impacts will be evaluated through extensive monitoring described in the response to comment #GFP-3(a), including land applied effluent, catchment areas, soil, vegetation, and prairie dogs. Monitoring results will be compared to trigger values and mitigation measures will be implemented if trigger values are exceeded (see response to comment #9). If wildlife exclusion fencing is used around land application areas, Powertech will submit the fence design to DENR and GFP for approval prior to installation.

Based on Powertech management experience at operating ISR facilities, revegetated well fields are likely to attract wildlife. Powertech does not foresee any risk to wildlife or equipment in the well fields, since all pipelines will be buried and well head equipment will be protected by enclosures. Design of well field perimeter fencing to permit big game passage is described in the response to comment #GFP-11.

5.6.11.1.2 Wildlife and Fisheries

The application states: Advanced planning of construction siting and activities in concert with continued monitoring can reduce impacts further and assist with the development of mitigation options, if necessary. Potential impacts to these species and others are discussed in greater detail in the following sections.
Comment GFP-6: Advanced wildlife mitigation planning, construction siting, and monitoring should consist of approved written plans and incorporated in the mine permit application. Operations or construction activities failing to preemptively minimize wildlife impacts could result in a direct violation of federal and state wildlife laws.

Response: The Avian Monitoring and Mitigation Plan that will be approved by GFP and reviewed by DENR and USFWS will provide written plans for wildlife mitigation planning, construction siting, and monitoring. This plan will be incorporated into the LSM permit application as Appendix 5.6-C. See also the response to December 2012 comment #1.

5.6.11.1.5 Raptors

The application states: ISR activities in the permit area would not impact regional raptor populations, though individual birds or pairs may be affected by ISR activities causing raptors to abandon nest sites proximate to disturbance.
Comment GFP-7: These activities constitute violation of State and federal laws protecting bird and raptors species and need to be acknowledged and addressed in the permit application. Specifically, activities' causing a "take" constitutes a violation of the federal Migratory Bird Treaty Act. Bald eagle abandonment of an active nest violates provisions of the Bald and Golden Eagle Protection Act. Bald eagles State threatened species protection is found in ARSD 41:10:02 and SDCL 34A-8.

Response: Section 5.6.11.1.5 has been modified to indicate that a written avian monitoring and mitigation plan will be followed to prevent potential impacts to raptors. In addition, Section 5.6.11.2 has been modified to indicate that if Powertech applies for a non-purposeful take permit, the application will be coordinated with GFP and DENR to ensure compliance with SDCL 34A-8 and other applicable rules and regulations. See also the response to December 2012 comment #1.

The application states: Powertech (USA) will develop a bald eagle mitigation plan for review and verification by SDGF&P.
Comment GFP-8: Plan approval should be incorporated in to the permit application.

Response: Sections 5.6.11.1.5 and 5.6.11.2 have been revised to specify that the avian monitoring and mitigation plan will be approved by GFP and DENR and the approved plan incorporated into the permit application as Appendix 5.6-C. See also the response to December 2012 comment #1.

5.6.11.1.11 Threatened, Endangered, or Candidate Species and Species Tracked by SDNHP State-Listed Species

Comment GFP-9: Only one bald eagle nest is documented within the permit area. A second, "alternative" nest is located near NE,NE,NE Section 31-T6S-R1E. Discussion of current plans regarding developments within suggested buffers need to be recognized in the permit application and mitigation coordinated with GFP.

Response: The avian monitoring and mitigation plan addresses the bald eagle nest described in the comment. This nest is currently being used and is being carefully monitored in accordance with the draft plan. Further, Powertech is currently avoiding all activity within 0.5 mile of the nest site to avoid potential disruption of the nesting pair. These activities are being coordinated with GFP.

5.6.11.2 Mitigation of Potential Ecological Resources Impacts

The application states: If direct impacts to raptors or other migratory bird species of concern occur, a Monitoring and Mitigation Plan for those species will be prepared and approved by the USFWS.
Comment GFP-10: As previously stated these activities constitute violation of State and federal laws protecting bird and raptors species. Mitigation of activities and monitoring plans need to be in place prior to construction and operation.

Response: As described previously, a written avian monitoring and mitigation plan that is approved by GFP and DENR will be incorporated into the LSM permit application. See also the response to December 2012 comment #1.

General comments:

Comment GFP-11: Barbed wire perimeter fencing should account for big game movement.

Response: Section 5.6.11.2 includes the commitment to design fencing to permit big game passage to the extent practicable. This section has been revised to include more details regarding the anticipated fence design, including: a bottom, smooth wire at least 15" to 16" above ground for pronghorn passage, a top wire no more than 42" high to facilitate passage of deer and elk, and an 11" to 12" space between the top two wires to prevent entanglement. These designs will apply to any new barbed wire perimeter fencing, which Powertech plans to construct around each well field as shown in the permit application (e.g., see Plates 5.3-1 and 5.3-2). While Powertech does not plan to construct perimeter fencing around the entire permit boundary, any new or replacement barbed wire perimeter fencing constructed by Powertech will consider big game passage.

Comment GFP-12: Annually wildlife monitoring and mitigation activities will be reported.

Response: Section 5.7.2.6 has been revised to include wildlife reporting requirements. Powertech will prepare an annual wildlife report for GFP and DENR that will address:

1) Bald Eagles and Other Nesting Raptors
    a. Results of annual monitoring of all known raptor nests and annual searches for new nests based on existing and planned disturbance, including a map showing current nest locations and conditions (intact, former) and the most recent 5-year history of each nest site, subject to data availability
    b. Discussion of surface disturbance and project activities within buffer distances of raptor nests
    c. Other monitoring requirements as listed in Appendix 5.6-C
2) Waterfowl and Shorebirds
    a. Operation and effectiveness of avian deterrent systems for facility ponds and results of water quality monitoring in treated water storage ponds if avian deterrent systems are not used
    b. Other monitoring requirements as listed in Appendix 5.6-C
3) Breeding Birds and Other Avian Species of Concern or Interest
    a. Results of clearance surveys for ground-nesting species in areas of planned disturbance
    b. Observations of avian species tracked by the SDNHP (location, habitat, etc.)
    c. Other monitoring requirements as listed in Appendix 5.6-C
4) Prairie Dogs and Lagomorphs
    a. Mapping and monitoring results of prairie dog colonies in and within 1.0 mile of permit area
    b. Description of prairie dog management efforts in and within 1.0 mile of permit area
    c. Results of annual nocturnal spotlight surveys for lagomorphs
5) Land Application (if used)
    a. Annual land application monitoring results (effluent, catchment areas, soil, vegetation, and prairie dogs) evaluating potential bioaccumulation of selenium and other metalloids/metals, and description of mitigation measures (if required).
6) Wildlife Mortalities
    a. Description of any wildlife mortalities observed within the permit area (see response to comment #GFP-13).

Comment GFP-13: Mortalities will be reported to GFP within 24 hours.

Response: Section 5.7.2.6 has been revised to include the commitment to report any wildlife mortalities within the permit area to GFP by phone and/or email with 24 hours.

Comment GFP-14: The application permit does not address mitigation of ore zone formation leakage caused by improperly plugged exploration drilling holes.

Response: A new section has been added to the LSM permit application to address mitigation of potential impacts from historical exploration holes (Section 5.3.3.9). In addition to summarizing information contained elsewhere in the application, this section presents some new information describing how TVA drill holes were plugged in accordance with State of South Dakota standards. Following is a summary of Section 5.3.3.9, Approach to Well Field Development with Respect to Exploration Holes.

Powertech has extensive information about the location of exploration holes within the permit area. A map of historical exploration holes is provided as Figure 3.2-7, and a detailed inventory is provided as Appendix 3.2-A. The vast majority of historical drill holes were plugged and abandoned in accordance with State of South Dakota requirements in place during drilling. Historical TVA drilling and Powertech's exploration drilling were conducted through DENR-issued Permits to Explore. These permits required exploration holes to be plugged with bentonite or cement grout. An exploration bond was held by the State to ensure the proper plugging of all exploration holes. A 1989 letter from TVA to DENR describes how to the best of TVA's knowledge, all TVA test holes were properly plugged and abandoned in accordance with applicable regulations. The letter has been added to the LSM permit application as Appendix 3.2-D. The letter discusses attempted mitigation of the one drill hole known to be seeping to the surface in the "alkali area." Throughout the entire proposed permit area, there is only one recorded instance ("alkali area") where water seepage to the surface is suspected to have come from an exploration hole (refer to Section 3.4.2.2.3).

Prior to developing each well field, Powertech will use best available information and best professional practices to locate exploration holes or wells in the vicinity of the planned well field, including historical records, color infrared imagery, field investigations, and potentiometric surface evaluation and pump testing conducted for each well field. Section 5.3.3.3 describes the procedures that Powertech will follow to demonstrate that the production and injection wells are hydraulically isolated from overlying and underlying aquifers. These include static potentiometric water level evaluations to identify any anomalous conditions indicative of leakage across aquitards; water quality sampling and evaluation to identify any potential areas of leakage; and drawing down the production zone sand unit through pump testing while recording the presence or lack of response in vertical monitor wells to evaluate vertical confinement. This information will be contained within well field hydrogeologic data packages submitted to NRC for review and verification/approval and submitted to DENR prior to operating each well field (see Section 5.3.3.4).

If it is determined that an unplugged exploration hole has the potential to impact the control and containment of ISR solutions, Powertech will plug and abandon or mitigate the exploration hole (see Section 5.6.3.2). It is not surprising that there is little evidence of unplugged holes in the proposed permit area, due to the well-known natural tendency of drill holes to seal themselves by collapsing and swelling of the formations.

Thank you for the prompt and thorough technical review. Please direct any questions regarding these comment responses to John Mays at (303) 790-7528 or Jack Fritz at (307) 672-0761.

Sincerely,

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